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FIFTEENTH YEAR.

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FURNACE FUEL.

Engineering and chemical science tend in their progress to provide the means of economising fuel. The investigations as to the generation of steam have largely borne on this point, and calculations as to the duty attainable from well arranged boilers and engines working under specific conditions are attaining greater accuracy, thus affording readier means for discovering such as, comparatively speaking, are working under a loss. The principal causes of low performance in a boiler are faulty design, unfavorable conditions of work, im proper management of the fire, and ineffective or wasteful fuel saving devices. As to engineering tests, boilers may be forced to do more work than they can do economically, and waste may be produced by discharging the product of combustion at too high a temperature. Where condensing engines are used, and the feed water is drawn from the hot well, the best course is to introduce a heater or "economizer" into the chimney flue. A rapid combustion on the grate is favorable to economy in boilers thus provided, and also in boilers having a large relative extent of heating surface. Rapid combustion with sufficient heating surface is more favorable to economy than slow combustion. In management of boiler fires economy is consulted by keeping the grate covered at a uniform depth, so regulating the draft as to maintain an unvarying steam pressure, and avoiding all unnecessary admission of cold air in cleaning the grate of clinker and ashes. A system of recording coal consumption from day to day, in addition to the use of a pressure guage, will prove of great service in checking ignorant or careless management. Damper governors should be especially looked to, for if these do not work properly waste of fuel or the imperfect combustion of the gaseous products must ensue. The employment of superheated steam is an efficient means of preventing loss, as the presence of a given amount of moisture in the steam induces several times the amount of condensation that would occur were it superheated. Manufacturers are more extensively than ever employing the hot water of condensation and waste steam for heating the feed water. Whilst economy is being more looked after, it is still true that waste in all we have indicated continues on a large scale. The extent of present competition in manufactures requires that every outlet of expenditure should be closely watched.

CHARGES OF EXPRESS COMPANIES

The express companies, like the leading telegraph companies, have established in the course of years an all but perfect organization in the collection, carriage and delivery of parcels, merchandise, bullion and specie, and they have fully secured the confidence of the entire community by their business energy, promptitude and unfailing good faith, invariably making good to shippers any losses of goods in transit, yet there is a prevailing conviction with the public that they are paying too dearly for express services; that the extra cost is more than sufficient for the extra care and dispatch. The enormous profits these companies are now realizing is no secret. They exist after all by virtue of railway facilities, and by certain compacts entered into with the companies, without which their arrangements would fall to pieces, and further there is nothing they can do which is not properly within the province of railway companies. But such organization as the express companies possess is not the growth of a day, and railway companies not having felt called upon to extend to the public the same accommodation have let a valuable business slip away from them. Through the power of express companies to transfer their business from one competing route to another, unless their terms are conceded they obtain carriage at rates far below those within reach of the general public. Could the public secure anything like the same terms they would give all their express business to the railways. As a means of reducing exorbitant and to some extent capricious express charges, it is to be hoped that the railway companies will enter into competition by affording increased facilities for the collection and delivery and rapid transmission of packages and articles requiring quick dispatch. Let them look up the express business. They can certainly do it cheaper, and this is what the public wants.

INDIA RUBBER MANUFACTURES.

THE position taken by india rubber manufacturers in resisting the advances made by importers and dealers in the raw material, secures general sympathy. The article has continued to advance, and fine Para grades are now held at $1.20. The manufacturers believing this advance to be purely speculativc, are inclined to resist it, a large number going further than the resolution by which they lately undertook to reduce their proportion 25 per cent., being inclined to suspend wholly the manufacture of rubber articles. We cannot but think the former course, which will sufficiently test prices, the most sensible; the policy of complete suspension would entail a greater loss on manufacturers than the alleged unreasonable excess of charge, and on resumption of work prices would certainly rebound, and owing to the exigencies of jobbers, higher rates than even those now prevailing would be demanded by importers. A very effective step to get rubber at prime cost has been taken by the appointment of a committee to devise a plan for the organization of a manufacturers' rubber importing company, with a capital of not less than $5,000,000. There has been an enormous increase in the consumption of india rubber not only for boots and shoes but for clothing and other goods during the past few years, which is growing. The use of gossamer cloaks by ladies has become very general, and the highest grade of rubber is invariably employed in their manufacture. Last year we imported 19,380,000 pounds, but receipts of rubber in the United States and Canada were but 18,047,000 pounds; hence our supplies were reduced 1,333,000 pounds. Our receipts so far this year appear not to be in excess of those of 1881, and therefore it is no matter of surprise that with an increased demand prices should have gone up. Last October the price was 82@84c., and in October 1878 only 49@50c.

IRON SHIP BUILDING IN CLEVELAND

We have no belief that wooden vessels will wholly disappear, but iron offers such obvious advantages for vessels of large tonnage that it is yearly coming into more extensive use. The past few years have witnessed a number of iron vessels launched on our lakes, and the business of building them at this port never ceases, orders succeeding orders. The facilities which Cleveland possesses for the construction of iron craft are fully equal to those of any other lake port. The sheet iron girders, nuts, bolts, beams and engines are here manufactured. The large iron vessels so far launched have proved a credit to their builders. They have been admirably modeled with improved interior arrangements for the storage of freight, as compared with wooden hulls, and they have had powerful engines placed in them. Water-tight compartments have been invariably introduced so as to secure the highest degree of safety. The iron vessels built at this port have found full employment and done good service. Their number has not been sufficient to affect the freights ordinarily earned by wooden vessels, but they have secured advanced rates. The iron vessels launched at Cleveland are among the largest on the lakes, and closely approach the desirable limit of tonnage dimensions for lake service. The enlargement of the Welland Canal will doubtless afford occasion in the future for the building at this port of still larger iron vessels for sea-going service.

A MORE than ordinary large number of transfers have been made throughout the season of real estate in Cleveland. No one doubts the advancing value of such property in this city, but here as elsewhere it has responded slowly to the improvement of business generally. At the same time a steady advance in real estate is apt to be of all others the most permanent, for where speculation on the part of buyers is not rampant rising values bear an ascertainable relation to demand. Whatever the market price of land and buildings here, buyers who can wait are certain to be recouped, if desirous of reselling, at no very distant date. Cleveland is steadily growing in population, her industries are multiplying, her position for the concentration of manufacturing products and her facilities for distribution are well nigh unsurpassed. There is abundant land for manufacturers to choose from in and about Cleveland, and so long as this is the case intending buyers are not willing to give extravagant rates.

WITH Monday of this week the New York, Chicago & St. Louis Railway went into partial operation. It was early in February of last year that the capital stock of $16,000,000 was subscribed on the company's books by New York capitalists. The line has certainly been pushed through with surprising energy. The main section is from Cleveland to Chicago, a distance of 340 miles, being 15 miles shorter than the Lake Shore route. Forty-six miles of the Wabash Canal gives the company 250 feet broad right of way through the city of Fort Wayne. Twenty miles west of Fort Wayne, at Fort Wayne Junction, the main stem is tapped by the branch to St. Louis, with a length of 325 miles.

IN the hope of high prices offered for futures, Western farmers are holding their grain back. The Egyptian troubles, which formerly offered one motive for this, has ceased; so also the contingency of a European war. Nor does the general run of the market in grain at San Francisco favor their hopes. On the contrary, there has been a uniform price for an extended period, and the condition of foreign markets affords every prospect of a drop. The great western trunk lines are meanwhile denuded of their ordinary grain traffic, but the loss appears to have been largely made up by the increase in other descriptions of freight. The sooner our farmers abandon their conservative policy the better.

IN his address on Iron and Steel before the Tariff Commission, Mr. Swank, the Secretary of the Iron and Steel Association, points out the important fact that the prices of iron or steel articles have not been out of harmony with the prices of other domestic products and American rates of wages. From this and other facts, set forth most cogently, every position taken being supported by statistics, he draws the following conclusions:

"If, therefore, the country has not been retarded in its development by a scarcity of iron or steel, or by the prices charged for them, but on the contrary has been assisted in that development by their abundance and cheapness, and by the labor necessary to create this abundance, then the mere observer of passing events must conclude that the manufacture of these products on a large scale in our country has been a blessing. He must conclude that, if their manufacture had not been encouraged, the country's importations of them would have been many times as large as they have been, and that dependence upon foreign countries for our supplies of these products would have caused us to send abroad large sums of money which have been kept in the channels of trade and enterprise at home. In 1860, the last year preceding the adoption of our present tariff policy, the country's production of pig-iron amounted to 821,223 gross tons, its production of rails to 183,069 tons, and its production of steel to 10,569 tons. In 1881, the last of the twenty-one years during which the present policy has been in force, our production of pig-iron was 4,144,254 gross tons, our production of rails was 1,646,518 tons, and our production of steel was 1,588,314 tons. During the whole twenty-one years we produced 39,566,491 gross tons of pig-iron and 13,498,494 tons of rails. No accurate account of our production of steel in the whole of the same period has been preserved, but in the ten years ending with 1881 it amounted to 6,552,983 gross tons, of which 429,874 tons were crucible steel. When the Morrill tariff was adopted this country had not produced one pound of Bessemer steel, and it was not until 1867 that its manufacture in the United States as a commercial product may be said to have been established. In that year we produced 2,276 gross tons of Bessemer steel rails, and in 1881 we produced 1,187,770 tons. In the whole period of fifteen years from 1867 to 1881 we produced 4,566,358 gross tons of Bessemer steel rails, almost every ton of which was laid in the tracks of American railroads. Our whole steel industry of every form may truthfully be said to have been created by the Morrill tariff and its supplements."

MANUFACTURES.

TO MACHINISTS, MANUFACTURERS AND OTHERS.

THE publishers of THE TRADE REVIEW solicit items of information concerning manufacturing and other establishments in any part of the country, and all such items will be promptly inserted in these columns, free of charge. Facts are the only things needed; and all communications should be accompanied with the name of the contributor—not for publication—but as a guarantee of good faith.

Manufacturers, machinist and engineers are particularly requested to communicate any matters of interest relating to their specialties. No one need be deterred from sending any interesting facts in his own language, as all such contributions will be properly revised before sending to press.

OHIO INDUSTRIES.

CLEVELAND.

THE works of the National Machinery Co., the well-known manufacturers of nut and bolt machines which are now being erected at Tiffin, will be 300x100 feet. The new foundry, 100x80 will be built next season. The works will be running in December next. A large additional force of hands will be employed.

THE Cleveland City Forge and Iron Co. are now in their new location on Lake street, where they have new buildings, 765x80 and 400x85, fitted at present with fourteen steam hammers and a complete outfit for doing railroad work. This gives them three times their former capacity, and additional buildings, including a new rolling mill, are contemplated next season.

THE Holt Manufacturing Co., manufacturers of the Holt portable forge, have increased facilities for manufacturing. These forges are built of all sizes, wrought-iron frame, and are noiseless. Over 2,000 are now in use and giving good satisfaction.

Cox & PRENTISS, of the Cleveland Twist Drill Co., have added improved machinery, which will increase their production of their special tools. Their circular states a change of prices to correspond with other manufacturers.

FROM 18,000 to 20,000 hands are employed by the great general hardware manufacturing company of Peck, Stow & Wilcox, Cleveland. The concern also have extensive manufactories in four places in Connecticut.

THE Butman Furnace Co., are setting twenty boilers in Chicago, a battery of eight being for J. V. & B. C. Farwell, and seven for the Chicago Northwestern Horse Shoe Co., all with their patent setting.

THE Cleveland Machine Co. have a new building, 75x25, fitted to do all kinds of drop forging, and in addition to their regular line of box machinery will manufacture carriage hardware.

THE Buckeye Stove Co., are making a very handsome line of cooks under the name of the "Buckeye." They guarantee the smoothness of the castings and the perfection of the fittings.

THE new works of the Excelsior Iron and Brass Co. will soon be completed. The company will manufacture switch and car locks, together with other specialties.

MR. BASTER, of the Cleveland Automatic Works, has patents on a new automatic cut-off engine that runs high or low speed without changing governor or valve gear.

THE Cleveland Woolen Co. has been incorporated with a capital of $60,000.

THE business of Whitmore Robinson & Co., Akron, manufacturers of the celebrated Ohio stoneware, was started in 1856, and various changes have taken place from time to time, both in extent and magnitude of the works and firm. The works and yards comprise about four acres. The several buildings of this immense concern have the following dimensions: The main building of brick (stoneware department), 50x170 feet, three stories; one 100x40 feet, three stories; one of stone, 30x70 feet, three stories; one of stone. 50x170 feet, two stories; one of brick, 40x70 feet, two stories; one of brick, 40x100 feet, three stories. Kiln sheds, warehouses and other small buildings for various uses cover ground to the extent of about half an acre. The aggregate floor surface is about two and a quarter acres. The number of hands employed in all departments is 150, and several teams are in constant use for hauling materials. Everything in the stoneware line is manufactured, and the works are supplied with the necessary machinery and appliances of the most perfect construction, especially adapted to this line of business. These works are the largest in the United States for the manufacture of stoneware. They have eight kilns, each having a capacity for burning 7,000 gallons at a time. Besides the manufacture of stoneware they also give considerable attention to the manufacture of yellow Rockingham ware. The demand for the products of this establishment extends in all directions, and a large and increasing trade has been built up in the Western States. The individual members are Richard Whitmore, Thomas Robinson, Henry Robinson, William Robinson, and J. B. Manton. The last named is the business manager.

THE Burton Manufacturing Co., Burton, manufacturers of Van Riper's improved revolving horse rake, wooden scoop shovels, handle lathes, seamless thimble skeins, castings, etc., have issued a special catalogue of their wares, in which they say: "We make a specialty of manufacturing thimble skeins, which for finish, shape, weight, material used, and durability, we will guarantee to be equal to any skeins in the market, and in some respects recognized by the trade as superior to any in the United States. We use nothing but the best quality of pig iron, and do not use any scrap iron in their manufacture, whatever. The threads on our skeins are cut by machinery, and one nut will fit the skein of the same size and hand. Our skeins are heavier than any other in the market. We have the facilities for manufacturing large quantities, and will fill orders promptly." With a large accession of business this firm has increased its capacity by adding a new engine and boiler of 80 horse power, and is enabled to fill promptly all orders. They employ 30 hands, and their foundry, machine shop, and wood-working departments are in full swing. Business so far has been good, and orders ahead are sufficient to keep their several departments busy until the Spring.

THE pottery of stoneware manufacture, Akron, owned and carried on by Cook, Fairbanks & Co., an energetic reliable firm, was established six years ago, but the present firm only took charge nine months ago. They have made many improvements since taking charge, viz.: Enlarged the building, built a new clay kiln, and placed a new engine and boiler in the motive power department. The grounds occupied cover an area of two acres, and the building is 60x120 feet, with basement used for engine room and dry-room. The works consist of two kilns, each with a capacity of 8,000 gallons per week. The engine used is fifty-horse power, and employment is given to fifteen hands, but when all the improvements are completed ten additional hands will be required. They manufacture a general assortment of all kinds of ware, including a variety of novelties. The demand for the articles manufactured by this firm extends all over the United States. In extent, capacity and completeness of appointments these works will compare favorably with any similar ones in the Union.

THE foundry of the Cleveland Car and Bridge Co., Cleveland, has a capacity for eighty car wheels per day, or enough for ten cars. The process by which they are made from cast iron to stand the wear and friction of countless miles of travel is the result of scientific calculation and skilled workmen. The iron used is a combination of Lake Superior and Hanging Rock. After the wheels are cast they are put through what is known as an annealing process, which hardens the metal and increases its durability. The most surprising thing connected with their manufacture is that while the tire of the wheel to the depth of three quarters of an inch is as hard as case hardened steel, the center or core of the wheel penetrated by the axle is soft. This is to permit it being reabily fitted by the lathe for the reception of the axle.

ANDREWS BROTHERS & Co., proprietors of the Haselton Iron works, Youngstown, have made and are still making very large additions to their facilities for turning out their productions, not only in new plant, but also in extensive buildings and erections. Having moved their rolling mill bodily from Niles, Ohio, where they were formerly located, they have rebuilt them on a much more elaborate and enlarged scale alongside their furnaces at Haselton, so that now they have everything compact and at hand. Their plant and machinery are of the best and improved kinds, and their facilities for making merchant iron, bar, hoop, band and sheet are not surpassed by any similar establishment in the country. We are also told that they will soon also be making a superior article of hot-polished shafting.

OUR Toledo correspondent writes: Mr. Edward C. Post, 80, 82 and 90 St. Clair street, successor to the firm of Smith & Post, machinist and founder and manufacturer of hydraulic and steam elevators, employs 18 hands. He has lately introduced some new improvements in machinery, among which is a lathe of great size and power. He has just finished a contract for 900 feet shafting, and placed in position a 4,000 lb. elevator for the Elyria Screw Co. The elevators made are hydraulic, steam and hand, both for passengers and freight.

THE Beaver Falls Wire Co., limited, has been incorporated and operations will commence immediately for the erection of the works on grounds that include a tract of four acres. The site is well chosen, and goods can be shipped on either road with equal facility. This is one of the most promising enterprises ever started here. There is represented here in these incorporations wealth sufficient to establish one of the largest manufactories of the kind in the country.

The Mahoning Valley Iron Co. has recently placed sixteen new boilers in their mills, arranging them in a manner different from those in other rolling mills. The boilers are placed between the puddling furnaces, receiving the heat from them in generating steam. In addition to this the smoke from one puddling furnace instead of passing out at the top of the stack passes under the boiler, and out of the next stack, thus utilizing a good portion of the heat.

THE Akron Sewer Pipe Co. gives employment to 65 hands and manufacture 750 car loads a year of their superior grade of sewer pipe. These are the

first sewer pipe works started west of New York City, and the second in the United States. The officers are: Frank Adams, president; D. L. King, secretary and treasurer. Both gentlemen have a thorough knowledge of the business and exercise a careful personal supervision over it.

At the Ætna Machine Works, Warren, successors to Douglass Machine Works, manufacturers of steam engines, circular saw mills, steam pumps, castings and machinery, there are ten hands employed. Mr. F. I. Freeman, the proprietor, has ready seven engines for shipment, also two saw mills for parties in Ohio, who have contracted in all for nine engines and four saw mills.

The Hall Rolling Mill at Hubbard has been started. The mill, which has 12 puddling furnaces and a finishing mill, has been standing idle since last spring, the Halls, who own it, not having been disposed to run or lease it to any one that would light the fires and start the wheels in motion.

The Hoe and Tool Works, Ironton, are filling an order for 250 picks with eyes opened. They are to be finished by the Michigan firm that has ordered them. The works are running full, with orders ahead. They are putting in a new tool hammer, which makes fifty-one in the establishment.

Books of subscription to the capital stock of the Kelly Nail and Iron Co., Akron, will be opened in that city on the 11th proximo, at the office of Wm. D. Kelly, in Exchange Bank. The incorporators are Ironton A. Kelly, B. S. Brown, D. S. Gray, W. W. Franklin, and Charles Parrott.

In addition to the new glass establishments Canton is working for, several other new manufactories are being started. Ground has been broken for the Ney Manufacturing Co.'s buildings and the Shook Millwright establishment.

The Woolsey Wheel Co., Sandusky, employs 120 hands, and has all they can do in filling orders. Mr. George A. Cooke is president, Mr. F. M. Woolsey treasurer, Eugene McFall secretary, and E. Flicinger, superintendent.

Work has been commenced on the buildings of the mill of Spaulding & Co., Brilliant. The machinery is being contracted for and the company hope to be ready to start early next year. Nearly all the stock is taken.

Thn Corns Iron Co., operating the rolling mill at Girard, have filed a petition in the Court of Common Pleas of Trumbull county, praying to have the corporate name changed to that of the Trumbull Iron Co.

The Massillon Bridge Co. has closed a contract with the Indiana, Bloomington and Western authorities to build a new composition bridge, 400 feet long, over the Scioto, at Columbus.

The capacity of the Akron Iron Co.'s rolling mill, Akron, has been increased 40 per cent.; the steam capacity is now 1,000 horse power, and the hands now employed 325.

The activity in car building is indicated by the fact that the Barney & Smith Co., Dayton, have orders on hand for six months ahead, although they are running 1,200 hands.

Wm. Kirkup & Sons, Cincinnati, have been established 36 years. They employ 90 hands in the manufacture of steam-heating apparatus, brass goods and iron pipe fixtures.

A new heating furnace has been placed in operation at the Grasshopper mill, Ironton, which will double the capacity of producing manufactured iron.

The Youngstown Steel Works are pushing the completion of their new buildings, and they will be ready to make steel castings early in November.

The Ironton Hoe and Tool Works are putting in a new tool hammer, which makes the fifth one in their establishment. They have lots of orders.

The new Champion Machine Works, at Springfield, will have a capacity of one machine per minute, and employ 2,500 men.

The improvements made in the Etna Foundry, Ironton, have increased the production of the furnace about 20 per cent.

The fires in the Hall Rolling Mill at Hubbard, have been lighted. Jesse Hall & Son, the owners, will operate the mill.

When completed the Ward Iron Co.'s works, at New Philadelphia, will be the largest works of the kind in Eastern Ohio.

The Whitney & Barnes Manufacturing Co., Akron, have increased their capital stock from $800,000 to $1,500,000.

The Youngstown Steel Works are completed, and the erection of the machinery is being proceeded with.

A patent has been issued to Mr. Charles F. Brush, Cleveland, for a secondary or storage battery.

The Smith Bridge Co., Toledo, have increased their capital stock from $60,000 to $80,000.

Large orders for nails are being placed with Youngstown manufacturers.

Orders at the iron mill at Ironton are too numerous for their capacity.

All the rolling mills in the Mahoning Valley are now in operation.

A safe and lock company in Cincinnati employs 650 hands.

All of Canton's manufacturing establishments are busy.

INDUSTRIES IN GENERAL.

MAINE.

The scythe factories at West Waterville are now fully under way, and some of them have orders for all the scythes they can make this season.

MASSACHUSETTS.

The business of the emery and corundum wheels at Chester has been purchased by Springfield parties, who have reorganized it with a capital stock of $50,000. They will build a new mill 100x40 feet.

James Hunter & Son, of North Adams, are operating their new machine shop. They are very much pressed for orders.

The new Holyoke Foundry has started work. This is an establishment that will bring about 75 skilled workmen into the city.

The Holyoke Machine Co. have ordered a 50,000-pound standard testing machine.

The Wright Machine Co., Worcester, have got out a new patent chuck rest. It was originally constructed especially for their own use, but it has proved so desirable they have decided to put it upon the market as one of their specialties.

CONNECTICUT.

The Hartford Iron Works Co., successors to the Woodruff Iron Works, Hartford, and Stockbridge, Mass., employ 60 hands, and are building some fine mining machinery.

At Hartford the Billings & Spencer Co. have recently purchased the file shop property, and are erecting new buildings thereon, and increasing the number of drop hammers, making thirty-four in all; an increase in twelve years of from two to thirty-four.—*Boston Com. Bulletin.*

NEW YORK.

At the Progress Machine Works, New York City, Messrs. A. & F. Brown, proprietors, the specialties being shafts, hangers, pulleys, couplings, etc., 138 hands are employed. The business has been established 27 years. Together with an active local trade the firm have a large export trade. The works are at 57, 59, 61 Lewis street, and 60, 62, 64, 66 Cannon street; the office and salesroom at 43 Park Place.

Mr. W. P. Davis, manufacturer of key seaters, drill presses, etc., North Bloomfield, writes us that his business continues good, and that he is receiving orders from all parts of the country. He forwards us at the same time a list of leading establishments near and far which have ordered his drill presses and key seating machines, the best extant, and which we have illustrated in this journal. It is gratifying to find his inventive genius and industry reaping their full reward.

The Bushwick Glass Works, Brooklyn, are about erecting a new furnace.

Gun-making is one of the foremost industries in Syracuse. The sales of guns manufactured there during the past year are said to have been $200,000, based on a capital of only $95,000.

PENNSYLVANIA.

Last year Allegheny county produced 505,182 net tons of steel, making a total of 813,783 tons. In the same year it produced 385,443 net tons of pig iron.

A large windmill and massive pump were shipped from Philadelphia a few days ago, for Port Elizabeth, South Africa, via England. The mill was made for pumping purposes.

A Pittsburgh firm are erecting a 30-pot steel-melting furnace for the London Car Wheel Works, at London, Ont. This will be the first furnace of the kind erected in Canada.

The "Beaver Wire Co., Limited," is incorporated, and is now actively engaged in erecting works at Beaver Falls.

The Messrs. Kloman are about to fill an order which will involve much more difficulty than the ordinary run of rolling-mill work. This order is from the United States Spring Car Motor Construction Co., of Philadelphia, and calls for eight steel springs, 300 feet long, 6 inches wide and ¼ inch thick.

MARYLAND.

Machine-made tinware has grown to be a large industry under charge of Henry Evans, jr., Baltimore. Over one hundred gross per day of plates, dippers, pans, wash bowls, etc., are turned out.

ILLINOIS.

The converting mill at Jolliet is turning out upwards of 3,000 tons of the best steel per week.

The new machinery for the Excelsior Iron Works, Chicago, is being placed, including a 20,000-pound lathe, 50 inches in diameter, and capable of swinging a shaft of ten tons. This is the strongest machine of its size ever brought to this city. Their new blacksmith shop is being supplied with a powerful trip hammer.—*Indust. World.*

A new company for the manufacture on an extensive scale of asphalt-wrought iron pipe has been organized in Chicago.

MICHIGAN.

The new iron works at Florence are enclosed and part of the machinery has been placed in position.

MISSOURI.

At St. Louis all the machine works are very busy, and some of them are largely increasing their capacity and working force. One concern there contemplates engaging in the manufacture of iron shingles. These shingles will have holes and hooks by which they be fastened in position and will be enameled so as to make a very handsome roof. The same company are also interested in cast iron monument business.

The Moore & Moss Foundry Co., manufacturers architectural iron work, chilled castings and chilled car wheels on a large scale, are about to add a cupola with a capacity of 29 tons per day, beside enlarging their foundry.

The Vulcan Iron Works, Cookson & Co., Kansas City, have just taken possession of their new works, and have added about $15,000 worth of machinery of the latest improved design.

The rail mill department of the Kansas Rolling Mill Co., Rosedale, have commenced the manufacture of bar iron, fastenings, etc. The capacity of the works is 35,000 tons per annum.

The St. Louis Chain Works are putting in additional machinery.

The Keystone Iron Works Co., manufacturers of steam engines, machinery, iron and brass work, Kansas City, will take possession of their new works, November 15. The works have a frontage of 274 feet and a depth of 128 feet. The cupola has a capacity of 12 tons a day.

CORRESPONDENCE.

FROM OUR SPECIAL TRAVELING CORRESPONDENT.

Detroit, Mich.

This really magnificent city grows in importance year by year. The commercial advantages of its position developed by local enterprise and aided by the general progress of the country are bringing it increasing wealth. The prosperity of its citizens is reflected not only in magnificent business structures, and manufactories resounding with the busy hum of labor, but in princely residences, and whole avenues of tasteful architecture. The streets of Detroit are the cleanest in the world, and its lofty position commanding a superb river front, affords sanitary advantages unpossessed by a host of cities. As usual, I have betaken myself among the manufacturers. The survey of their operations has proved highly gratifying. Trade everywhere is good and no misgiving is entertained as to the conntiuance of this condition of affairs.

The marine interest of Detroit is largely and rapidly growing. It is believed the time is not far distant when this city will become the second largest grain shipping point on the lakes. The aggregate value of lake tonnage and dry dock property owned here is not less than $5,000,000. A vast amount of shipbuilding is continually going on here; the business dates back 25 years.

The works of the Michigan Malleable Iron Co., at Detroit, have been in operation some time, and by their improved air furnace process of manufacturing, are successfully engaged in turning out a very superior article. The officers of the company being men of decided enterprise, and backed by large capital, spare no effort to make their works second to none in the United States, not only by the introduction of the latest and most improved methods of manufacturing, but by securing the services of workmen who have made the subject a study, and who have had unusual facilities to practically demonstrate the ability to make malleable iron of superior quality. The company have secured as superintendent of their works, Mr. A. Fassler, a skillful mechanic and thoroughly versed in the manufacture of malleable iron, and who is well-known to your readers as superintendent, until recently, of the extensive works of the Champion Malleable Iron Co., of Springfield, in this State. ——Berry Brothers, manufacturers of varnishes, corner Wight and Leib streets, were established in 1858, and employ over 100 hands. The firm have eight branch houses in different parts of the country. They report trade good.——The Colliau Furnace Co., furnace and cupola builders, owners of the Victor Colliau patents for improvements in cupola and other furnaces, are doing a splendid business. In their illustrated circular the company remark that ordinary cupolas use too much fuel and are uncertain in their working and results; large quantities of gas burn at the top of the chimney which should be consumed in the melting process; and most cupolas in long meltings will clog and chill, causing delays, losses and annoyances familiar to every foundryman. The advantages claimed for the Colliau improvements are: 1st. A saving of from 25 to 50 per cent. of fuel by securing more perfect combustion at the melting point. 2d. The iron is improved by the melting, and a pure, uniform metal is obtained. 3d. Much greater rapidity of fusion, often doubling the ordinary cupola capacity. 4th. Hot fluid iron all through the heat. 5th. The cupola can be worked by unskilled workmen if instructions are followed. 6th. Concentration of the fire in the smallest possible compass. The metal in fusion has less space to traverse while exposed to the oxydizing influence of the blast. This insures tougher castings, and less waste by oxidation in the furnace. 7th. The improvement can be applied to ordinary cupolas in a few days, and without difficulty. 8th. By this process the cupola does not clog. Melting is practically continuous as long as desired—100 tons of iron have been melted in one 58 inch cupola in six and one-half hours; and the cupola remained in perfect condition to the end. 9th. A perfect "chilling iron" can be relied upon when desired. 10th. In the practical use of this cupola there is no fire to be seen at the loading doors, and no throwing off of combustible gases—carbonic acid gas alone escaping; the top of the cupola being as cool as if there were no fire below. The testimony of leading works throughout the country in which cupolas are employed, and published in the company's pamphlet, fully substantiate the claims set forth as to the surprising quantity of metal melted, regard being had to the size of the cupola, the moderate amount of fuel used, the ease and certainty of melting, the continuousness of the melting process as long as desired, the freedom from clogging or "hanging" and the perfect castings afforded.——The Sheridan & McGough Refrigerator Co. are about organizing for the manufacture of refrigerators to be used in cars, hotels, &c. From what I have seen of the model, I judge the refrigerator to be one of the best ever invented. Mr. McGough being an old hotel man knows just what the public needs. Mr. Sheridan is well known in Cleveland, having been a former resident there. I anticipate forwarding you illustrations of the refrigerator with descriptive particulars. That suited to railway cars has three cooling pipes for the salted ice packed in angles formed between the roof and walls. These receptacles have to be filled but twice between St. Louis and New York, thus effecting an important saving, as other refrigerator cars have to be replenished three times. The waste pipe is at the bottom of the car. There is abundant money in the enterprise.——The Alexander Manufacturing Co., whose office is 32 Congress st., West, and their factory at Hamtramck, have 23 hands in their establishment. They have a good trade, making shipments East and West.——The White Elephant Cafe, 157 Jefferson Avenue, the proprietor of which is Mr. F. McGough, an old hotel man, has a high reputation for the excellence of the brands of whiskies, brandies and wines there purveyed. In the first named the "Private Brand" put up by Mr. McGough takes the lead.

The E. T. Barnum Wire and Iron Works, 27, 29, 31 Woodward Avenue and 12, 14, 16, 18 Atwater st., are producing wire articles on a large scale and in great variety. The designs are original and tasteful and weave the wire into articles not only beautiful but precisely suited to their various purposes. The mechanical art is as noticeable as the artistic skill displayed. Strength is combined with lightness in a high degree, and an appearance of solidity also is afforded. I have been much struck with the beauty of their jardiniere and flower bed stands, altogether in new styles, and which mount the plants to perfection, affording a charm even in their grouping. Gothic and Norman arch flower stands are met with in their stock, with a fascinating elegance about them; these are so packed as to be shipped without injury. A stand with arch and basket is peculiarly attractive, so also a wire guard for window shelf. Now that cold weather is approaching it will be of service to mention their round top spark guard, fitting the grate closely, and their plated wire stove guard, which are made in halves and open easily to reach the fire, one size opening on hinges. They are made of plated wire with moderate sized meshes. These works are doing a large and rapidly increasing business. Among their productions are balcony and office railings, wire cloth, roof cresting and finials and emblematic signs for various trades.

SCIENCE AND INVENTION.

Splicing Wires.—Mr. Frank M. Harris, of St. Charles, Mo., has recently patented a device for splicing wires. The device consists of two bars of iron or steel connected by a handle at one end, and having at the opposite end tapering notches opening toward the handle, and a similar device having notches projecting from the handle, the two forming a clamp to hold the lapped end of the wires when their handles are drawn together.

Improved Wheel for Vehicles.—Mr. William F. Crowell, of Las Vegas, N. M., patented an improved wheel for vehicles that is so constructed that any shrinkage of the wheel may be taken up without removing and resetting the tire. The improvement consists in constructing the wheel with a wedging device between the ends of the fellies, that when the tire becomes loose may be drawn down by bolts to spread the fellies and to tighten the tire.

Reciprocating Motion.—A mechanical movement for producing reciprocating motion has been patented by Mr. Anton Dilger, of Rockville, Wis. A horizontal shaft fitted in a frame has at one end a pinion that engages with a rack fitted for vertical movement in an upright secured to the frame. Upon the outer end of the shaft is hung a weighted pendulum. When the pendulum is vibrated the pinion imparts a reciprocating motion to the rack bar.

Removing, Applying, or Brightening Textile Fabrics.—In a recently patented English process, for the purpose of bleaching a woven fabric, it is passed between a pair of carbon rollers, having connected to them the wires of a galvanic battery or dynamo machine. The passage of the electric current from one roller to the other, through the fabric, causes an action to take place which removes or bleaches color. Colors may be applied or developed by using solutions of suitable salts in combination with the electric current.—*Cotton, Wool and Iron.*

Piston Valve.—Edward A. Wildt, Long Island City, N. Y., has patented the combination of a steam chest having steam passages, a reciprocating slide valve having thicker and thinner portions opposite each other, and mechanism whereby simultaneously with the reciprocating motion, a shifting motion is imparted to the valve so as to gradually enlarge the exhaust opening for the free exit of the exhaust steam.

FOREIGN CORRESPONDENCE.

ENGLAND.

Wolverhampton, October 7.

The Manchester Conference of delegates last month advised the miners to inaugurate a general strike throughout the country on October 1st if the coalmasters did not accede to the demands for advanced wages. No strike has yet come off, nor will it. Choosing between two evils, the coal-owners seem disposed to increase wages and the selling price of coal, to keep the men at work rather than incur the heavy loss which a suspension of work would entail. The colliers' agitation seems to be general throughout the country, and advances are being conceded in all districts, so that an advance in manufactured iron of from 5s. to 10s. per ton may be looked for in all districts. However anxious the ironmasters and manufacturers may have been to continue the £7 10s. basis for marked bars, it seems that they can hardly have any alternative but that of advancing marked bars to £8 next week. It is feared that the advance may affect injuriously the United States demand. The Glasgow market closes at 51s. 0½d. The Middlesbrough market continues very firm. The Cleveland ironmasters have agreed among themselves to continue the restriction of their output until the end of the year. Pig iron makers in other districts have this week instructed their brokers to advance quotations 2s. 6d. per ton, but business has been rather quiet, as is usual before the great quarterly gatherings. The pig iron market is firm, and prices have advanced since last week. No. 3 Cleveland is selling at 44s. 6d., and in one or two cases a little higher. Stocks are decreasing considerably, although the demand from Scotland is declining. There is now only a very little difference between the price of Scotch and Cleveland iron, and when the carriage and difference in quality is taken into consideration it is not surprising that the quantity sent to the Scotch ports is lessening. Finished iron is not so strong.

Protection of Forests.—The preservation of forests is attracting increased attention in this country. It is a subject of importance. The history of the countries of the old world and indeed of the older portions of our own country contains a warning that we should heed. The destruction of their forests has resulted in the most disastrous climatic changes. In this country we have evil more direct to threaten us and urge us on to the work of forest culture. The increase in our population creates an increase in the demand for wood. For certain uses we must have wood; no other material can take its place. In this country our waste lands are not wooded lands; we cannot go to them for the supplies of necessity. The large areas of new country in the west are mostly treeless plains. In this respect we lack one of the advantages that European countries once possessed. This lacking will hasten the day, if not averted by decided action, when the natural growth of wood cannot supply the demand. Wood forms the first and the last implement of humanity. It is the universal material of agriculture, manufacture, commerce and art. There will always be a demand for it; and if that future demand is to be supplied we must not wantonly waste the forests we now have.

Puddling.—No change in the old and present system of puddling will occur until a process is worked out which entirely does away with the skill of the puddler as at present exercised. That the rotary system has done this is true; but there are many drawbacks to be contended with in its working. For the operation of any new process aiming at this result great and costly alterations in existing plant will be necessary, alterations which, in the present condition of the metallurgy of iron, would be neither wise nor expedient. We are now in the midst of an epoch of uncertainty; a few years more and the success or failure of steel to supplant wrought iron will be established beyond a doubt. Its success depends upon the results which shall be obtained from the working of all grades of pig iron, and its failure is certain if uniform quality cannot be produced. For the present, therefore, the system of puddling must continue as of old; but every iron master, not only of this, but of all other countries, will most gladly welcome the process, whether it be of steel or of iron, which shall supplant the weary toil of so many thousands, and usher in a brighter and better era than could ever be accomplished by the puddling process as invented by Henry Cort.

ITEMS OF INTEREST.

A piece of iron is appreciably heated in being magnetized.

The consumption of rails, for renewals alone, amounts to half a million of tons annually in the United States railroads.

The export of breadstuffs in September last amounted in value to $24,506,067 against $19,947,-433 in September 1882, and for the nine months ended September to $134,512; 779 ,against $177,-452, 639 in the previously corresponding period.

Of hammers it may be said of the different forms and sizes that the jeweler has the lightest, the iron-worker the heaviest, the shoemaker the broadest, the upholsterer the longest, and the file-cutter the oddest.

An anti-friction composition, used with great success in Bavaria, instead of oil, tallow, etc., is thus made: Ten and one-half parts of lard are melted with two parts of pulverized plumbago; the lard is melted, the plumbago mixed in slowly, stirred well, and the mixture applied cold.

The largest locomotive ever built has been completed at Paterson, N. J., and is one of twenty-five ordered by the Central Pacific Railroad. Its weight without the tender, is sixty-two tons. The cylinders are twenty by thirty inches, and there are eight drivers and a four-wheeled truck.

The London *Engineer* has made careful estimates upon the costs of transporting coal by railroad, figuring in interest, wear and tear, and all the items of expense incurred by railroads, and reaches the conclusion that they would make large profits upon this kind of traffic, at two shillings (50 cents) per ton for 100 miles of carriage.

Arizona covers an area of 72,000,000 acres, four-tenths of which is mineral bearing. Since 1849 there has been extracted from seven states and territories the sum of $2,100,000,000, for which California is credited $1,148,306,731; Nevada, $469,125,943; Idaho, $71,523,901; Oregon and Washington Territory, $48,637,251; Utah, $55,-848,831, and Arizona $17,930,165.

A cubic inch of gold is worth $210; a cubic foot, $362,380; a cubic yard, $9,797,762. This is valuing it at $18 an ounce. At the commencement of the Christian era there was then in the world $427,000,000 in gold. This had diminished to $57,000,000 at the time America was discovered. Then it began to increase. Now the amount of gold in use is estimated to be $6,000,000,000.

A novel form of ceiling decoration has been adopted in the reading rooms of the Grand Pacific, Chicago. The entire ceiling and wall borders are of glass, double thick plate, laid in panels of cherry molding. The inside of each square glass is richly decorated in various forms of modern decoration, and the whole has been completed in a combination of colors and designs very pleasing to the eye.

The biggest blast ever undertaken on the Pacific coast was exploded on the Oregon and California Railway track. Nearly 6,000 pounds of blasting powder were used, and the shock was so tremendous that an adjacent stream was thrown out of its bed, the highway was badly injured, and effectually blockaded for some distance, and damage was inflicted in the workmen's camp 900 yards away.

The following has proved a good formula for making solder for nickel: For fine or high grade nickel, three parts yellow brass, one part coin silver. For low grade nickel, fifteen parts yellow brass, five parts coin silver, four parts zinc (pure or plate zinc). Melt the brass and silver with borax for a flux, and add the zinc in small pieces, stir with an iron rod, pour in a slab mold, and cool slowly, when it can be rolled thin for cutting.

The free canal campaign work has begun in earnest in New York. There are now 5,000 canal boats, 20,000 horses and 100,000 people engaged, with an investment of $15,000,000 capital. Each canal boat coming to New York cost $150 fees and charges. The mercantile interests want the canal free, in order to prevent the trade from going to Europe by way of Canada and the Mississippi river, from Chicago and the great Northwest.

There is now to be seen at the Pennsylvania Railroad Co.'s depot at Jersey City a passenger car lighted by seven incandescent electric lamps, representing the initial effort of the Pennsylvania company to introduce electric lighting on their cars. The incandescent lamps used are manufactured by the Edison Electric Light Company, the electric force working them being supplied by a number of Faure's secondary batteries manufactured by the Light and Force Co., of New York. The car has made several journeys between New York and Philadelphia, its occupants enjoying the comfort of a clear, powerful, steady light.

MECHANICAL RECEIPTS AND ITEMS.

Tinning Plates.

The operation of tinning plates is as follows: Each plate is lifted singly from the grease pot and stood on edge in the tin pot and allowed to remain immersed in the hot tin for about twenty minutes. (The tin pot is always kept nearly full of plates). When lifted out the plate is allowed to drain for a moment, and is then changed to the first division of the wash pot for a few minutes, on leaving which it is brushed with hemp, dipped in the second division of the pot, and allowed to drain for a few minutes in the pan. The thick edge or list is removed by momentarily dipping it (the edge) in the hot tin contained in the list pot and jarring the plate. After this the plate is returned to the grease pot for a few minutes, from which it is drawn out between rollers which smooth and straighten the plates. They are finally cleaned by rubbing them with shorts or bran and leather, sorted and boxed—each box of IC plate containing 112 pounds or 112 plates, the plates having a gauge of No. 30, and weighing one pound each. IX brand weighs 140 pounds to 112 sheets. In the trade the grade, weights, and sizes of the plates are indicated by certain marks. The use of ingot steel or very mild steel, for making tin plates is now an established thing, and manufacturers are now taking this metal for making large tinned sheets up to seven feet by three feet.

Cold Soldering.

It must be borne in mind that, though the first preparation is tedious, a large quantity of the material can be made at once, and the actual soldering process is as simple and quick as it well can be. Flux:—One part metallic sodium to 50 or 60 parts mercury. (These combine on being well shaken in a bottle. If this is too much trouble, the sodium amalgam can be bought, ready made, from any chemist or dealer in reagents). The sodium amalgam must be kept in a stoppered bottle closed from the air. It has the property of amalgamating (equivalent to tinning by heat) any metallic surface, cast-iron included. Solder:—Make a weak solution of sulphate of copper, about 1 once to 1 quart of water. Precipitate the copper by rods of zinc; wash the precipitate two or three times with hot water; drain the water off, and add for every 3 ounces of precipitate 6 or 7 ounces of mercury; add also a little sulphuric acid to assist the combination of the two metals. When combined they form a paste which sets intensely hard in a few hours, and this paste should be made, whilst soft, into small pellets. When wanted for use, heat one or more of the pellets until the mercury oozes out from the surface in small beads; shake or wipe them off, and rub the pellet into soft paste with a small mortar and pestle, or by any other convenient means, until it is as smooth and soft as painter's white lead. This, when put on a surface previously amalgamated by the sodium and mercury, adheres firmly, and sets perfectly hard in about three hours. The joint can be parted, if necessary, either by a hammer and cold chisel, or by a heat about sufficient to melt plumber's solder.

How to Weld a Broken Spring Plate.

Get the length and then take the part of broken plate which is easiest to handle and upset it suitable for welding. Make a piece of iron $\frac{5}{8}$ inch wide, quite thin at one edge, leaving the other about $\frac{5}{8}$ inch thick, something like a razor blade. Take a welding heat on the part that has been upset and weld the iron across, having the thick end on the point of the plate. Scarf it for welding, upset the other part of the plate and scarf it so that when welding the piece of iron comes between the two steels. In the first heat—it cannot be done in one—don't strike too hard at first, and thin down any thick edges of the scarfs. Take a second heat and the result will be, in the hands of an average smith, a good sound weld. If the steel is at all fiery do not attempt to weld it. Should there be a hole near the broken place, showing, on being heated, any sign of a flaw, make a new plate. The piece of iron welded between facilitates the welding, and also makes up for the length lost in jumping.

Making Alloys.

1. The melting pot should be red hot (a white heat is better), and those metals first placed in it which require the most heat to fuse them. 2. Put the metals in the melting-pot in strict order, following exactly the different fusing points from the highest degree of temperature required down to the lowest, in regular sequence, and being especially careful to refrain from adding the next metal until those already in the pot are completely melted. 3. When the metals fused together in the crucible require very different temperatures to melt them a layer of charcoal should be placed upon them, or if there is much tin in the alloy a layer of sand should be used. 4. The molten mass should be vigorously stirred with the stick, and even while pouring it into another vessel the stirring should not be relaxed. 5. Another hint is to use a little old alloy in making new, if there is any on hand, and the concluding word of caution is to make sure that the melting pots are absolutely clean and free from any traces of former operations. Soft Alloy.—This alloy will adhere so firmly to metallic, glass and porcelain surfaces that it can be used as a solder, and is invaluable when the articles to be soldered are of such a nature that they cannot bear a high degree of temperature. It consists of finely pulverized copper or copper dust, and is obtained by resolving copper sulphate, or vitriol of copper, into its original elements, by means of metallic zinc. Twenty, 30 or 36 parts of this copper dust, according to the hardness desired, are placed in a cast-iron or porcelain-lined mortar, and well mixed with some sulphuric acid having a specific gravity of 1.85. Add to the paste thus formed 70 parts (by weight) of mercury, constantly stirring. When thoroughly mixed the amalgam must be carefully rinsed in warm water to remove the acid, and then laid aside to cool. In ten or twelve hours it will be hard enough to scratch tin. When it is to be used it should be heated to a temperature of 375deg. C., when it becomes as soft as wax by kneading it in an iron mortar. In this ductile state it can be spread upon any surface, to which, as it cools and hardens, it adheres very tenaciously.

Welding Copper.

Copper may be welded by the use of proper fluxes. The best compound for this purpose is a mixture of one part of phosphate of soda and two parts of boracic acid. This welding powder should be strewn on the surface of the copper at a red heat; the pieces should then be heated up to a full cherry red, or yellow heat, and brought immediately under the hammer, when they may be as readily welded as iron itself. For instance, it is possible to weld together a small rod of copper which has been broken; the ends should be beveled, laid on one another, seized by a pair of tongs, and placed together with the latter in the fire and heated; the welding powder should then be strewn on the ends, which, after a further heating, may be welded so soundly as to bend and stretch as if they han never been broken. It is necessary to carefully observe two things in the course of the operation. First, the greatest care must be taken that no charcoal or other solid carbon comes into contact with the points to be welded, as otherwise phosphide of copper would be formed, which would cover the surface of the copper and effectually prevent a weld. In this case it is only by careful treatment in an oxidizing fire and a plentiful application of the welding powder that the copper can again be welded. It is, therefore, advisable to heat the copper in a flame, as, for instance, a gas flame. Second, as copper is a much softer metal than iron, it is much softer at the required heat than the latter at its welding heat, and the parts welded cannot offer any great resistance to the blows of the hammer. They must, therefore, be so shaped as to be enabled to resist such blows as well as may be, and it is also well to use a wooden hammer, which does not exercise so great a force on account of its lightness. Mr. Rust, the inventor of this process, states that, as long ago as 1854, he welded strips of copper plates together and drew them into a rod; he also made a chain, the links of which had been made of pretty thick wire and welded.

PRACTICAL MECHANICS.

WROUGHT AND CAST METAL.

By Thomas F. Hagerty.

It is well understood that a wrought article or its equivalent cannot be made by any method of casting. A casting is always a casting, with all the peculiarities and distinctions and differences of structure which make it a separate and distinct thing from a wrought article. And the fact that a thing is made of wrought metal instead of cast metal is of itself sufficient, in most instances, to make it a totally different thing in its structure,in its properties and in its utility, just as much in very many cases as if it was made of a totally different metal. And, aside from this, the matter of economy of material when the difficulty of substituting wrought metal for cast is overcome, is even in itself a matter of the utmost importance in the trade. There is another property of wrought lead, as distinguished from cast lead, to which I have not thus far referred, and that is that it is not possible to cast lead articles of any given superficial area of the same thickness as those articles can be made of the wrought lead; thus, for example, a seamless lead trap—which is formed by forcing the metal through a die—is of necessity a wrought metal trap, inasmuch as the cast or crystalline structure is destroyed by the pressing and drawing action exerted upon the metal while being shaped. And this wrought lead trap may be made with walls of any desired degree of thinness; in other words, the wrought metal may be brought to the precise thickness which combined utility and economy may suggest, whereas with cast lead it is impossible to form a trap of the same size or diameter, with walls less than a given and greater thickness, and this ratio of thickness which cannot be diminished increases with the diameter of the trap, so that in the larger size and to a certain degree, even in the smallest size of cast lead traps, there is a certain waste of metal as compared with the quantity of metal required to make a wrought lead trap of the same size. In other words, the cast lead does not possess the property of being formed in the thin walls, which economy of material demands, while that desirable property is possessed by the wrought lead. I find that when the lead is cast in the cored mold (the mold has to be made with a core, otherwise the trap could not be made hollow), to the form of an S trap, the lead will not flow entirely around the core unless there is a certain space between the core and the walls of the mold, proportioned to the diameter of the trap to be made. The reason is that if this space be too narrow, the lead, passing in a thin stream around the core, will chill before it gets entirely around, so that the edges of the metal flowing to and around opposite cores of the mold will either not come together at all, or if they do come together will be so chilled that they will not unite. This lack of union is so common that it has received a distinct name for itself, namely: 'cold shot' casting. Such a casting is of course useless, and is only fit to be remelted. If the space within the mold, that is to say, the space between the core and the shell, or outside part of the mold is made sufficiently large to prevent this, then more lead is used to make the trap than is necessary for strength, and this excess of lead is of course just so much waste.

If we try, as has been frequently done, to prevent this 'cold shot' casting by heating the mold so that the lead will flow around the core regardless of the narrowness of the space, a new difficulty is introduced; that is to say, the lead adheres to the surface of sheet iron in the manufacture of sheet tin, and this, of course, not only spoils the casting but damages the mold. There is, therefore, this important distinction between wrought lead and cast lead in the manufacture of plumbers' traps, that wrought lead can be wrought into traps having the walls just thick enough for strength and no more, without waste of metal, while, cast traps, have to have an excess of metal in them beyond what is reqnired for strength, and this is just so much waste of metal. Before the molds are filled with the melted metal, they are, of course, occupied by air, inasmuch as it would be out of the question to work the molds in a vacuum. Lead is more easily oxidized when heated than any other of the common metals and this oxidization occurs almost instantly whenever a surface of melted lead is exposed to the air. When the lead is poured into the mold it comes in contact with the air contained in the mold, and a film or skin of oxide is formed upon it, and this either remains upon the surface of the edges of the lead and prevents the edges from joining, even when the lead has not cooled enough to form a real 'cold shot,' or it is broken up and divided into the mass of the melted lead and renders it brittle, just as antimony and many other impurities frequently render it brittle. Furthermore, the film or skin of oxide may itself sometimes remain intact, and stay in the lead as a foreign body, and make a hidden impurity, corresponding, as we might say, to a chip embeded in the lead, and liable at any moment to make itself manifest by a break in the casting under pressure. No such thing is possible when lead is wrought, by being forced under compression through a die in the more or less plastic condition in which it is subjected to that operation.

More About Flameless Combustion.

An examination of results, said Mr. Thomas Fletcher in his lecture at the Institute of Mechanical Engineers, Manchester, England, shows at once that the combustion takes place by simple contact of the gases with a surface sufficiently hot to cause combination, and that flame, as flame, has no existence. Since the first note on this subject was published, a friend, who is a large brewer, tells me that on drawing the fire from his coppers he has noticed the contents suddenly boil up furiously, and there is a visible glare of heat all over the hot lining of the fire hole. This he never could account for until the hint gave him a clue to the fact that the gases from the drawn fuel were burning without flame by simple contact with the red-hot fire-bricks. This leads us to a suggestion for the practical use of a perfect method of burning solid fuels, and, so far as present experiments go, that an open mass of brick-work, set like a Siemens' regenerator behind any furnace, between any furnace and the flues, does by its heat insure the perfect combustion of all gases which come in contact with it, at the same time giving off the heat formed to be utilized in the flues. I beleive it will be found totally impossible to pass either smoke or unburnt fuel in any form through an open work screen of fire-brick, provided sufficient air is present for combustion; and as this screen takes up instantly the heat generated by the combustion, it would keep itself in a state of incandescence. This leads again to another matter, with regard to steam boilers, that the present system of large flues is a costly blunder. So certain was I of this, that my own boiler was made of a simple cylinder without internal flues, the flue underneath built the full size of one-half the diameter of the boiler, without return, and with a maximum diameter of flame space of five inches, the bridge being continued the whole length. This boiler, which, as it stands, was condemned on all sides as a rare coal burner, suitable for a colliery, has proved itself a wonderful economical one; and our difficulty has been not to get steam, but to keep the fires low enough to keep the safety valve on its seat. The boiler about corresponds in nominal capacity with the engine, but has never yet been worked to one-third its available power. It is doubtful whether in practice any really good results will be obtained, unless the fuel is first converted into gas, which is an easy matter, and also until a system of inlet is used, which automatically proportions the gas to the air supplied. With these, we can, I think, obtain the full theoretical duties in actual work. Under the present system we produce our heat with the result that the larger proportion of it is thrown away, becoming, after doing the work, so diluted as to be practically useless. There is something here radically wrong, a waste of enormous energy and a waste of fuel, which must some time come to an end. We are living on our capital, in the apparent hope that when our fuel stores are used, all creation will be unnecessary—at all events we do not care what happens. You will appreciate the world of applications and inventions which the system of flameless combustion opens out. It is an unexplored mine, probably full of great prizes to those who can see in what direction to experiment. I have been familiar with its existence for years, but the possible value of the matter has only recently received any consideration. Its only practical application up to the present has been in the injector furnace, of which I have one here of the smallest size. It is curious that thousands of these furnaces have been in use for years all over the world, burning coal gas and the lighter petroleums, without the peculiar flameless condition of the inside of the furnace having attracted any serious attention, even from myself, although constantly using it. That extraordinary results are obtained in this furnace I will prove to you by taking this cold furnace and melting and pouring a crucible full of cast iron so quickly that the casing, although only one inch thick, has no time to get warm outside. That it is not warm I will prove, not only after taking it up in my hands after pouring the metal, but by sticking a lump of tallow on it, which you will see does not fall off. I cannot tell you the time necessary to melt the iron, as I do not know your gas, but expect it will be five or six minutes.

Porcelain Enamel for Iron.

Flint (quartz), calcined and ground, one hundred pounds; borax glass (anhydrous borax) ground, fifty pounds. Mix, fuse together in a crucible, and let it cool slowly. Powder and mix forty pounds of this glass with five pounds of kaolin (white potter's clay), and grind the mixture to a fine paste in water; pickle the vessel in dilute sulphuric acid, and scour with sand to thoroughly cleanse its surface; then line it with a coating of the above paste about one-sixth of an inch thick, and let it stand in a warm room until the coating has partially dried. Next dust over the surface of the paste coating (still moist) the following powder, and dry in an oven at 120 deg. Fah.: White glass free from lead or arsenic, one hundred and twenty-five pounds; carbonate of soda, fused, powdered, moistened with water and dried, twenty pounds. To forty-five pounds of this add one pound soda. Mix thoroughly with a little hot water, dry, and reduce to fine powder. When the coating on the iron has dried, the vessel is put in a muffle and the heat gradually increased until the glaze fuses, when it is taken out, more glaze powder is dusted on, and after a second heating allowed to cool very slowly. Some of the glazes employed consist of friable mixtures of feldspar sodium carbonate, borax, and oxide of tin. Feldspar is also sometimes added to the enamel body.

Malleable Nickel.

Zinc can be successfully alloyed with nickel by reducing their oxides in a state of admixture. By rapidly fusing the alloy thus obtained a tough, malleable, and ductile metal can be made. The melting point of nickel is too high to admit of zinc being introduced into it after the nickel is molten. The addition of 1-10 per cent. of magnesium is made to improve the working properties of this alloy. It is not likely that important applications will be long wanting for a metal possessing such valuable properties as malleable nickel, the price about one dollar per pound, being comparatively low. Malleable nickel anodes are already being substituted for the old cast anodes. The former certainly have a great advantage in their uniformi ty of structure, which not only prevents to a great extent their being eaten away irregularly, but also avoids less through secondary currents. The greater rarity and consequent higher price of cobalt precludes its general use in the metal state. It is, however, said to be used for electro-plating, the articles coated with it being sold as superior nickel plate.

Imitating Magnetism.—Professor Bjerkness, of the University of Christiana, Norway, has, for some time past, been making interesting experiments on magnetism, and has been able to closely imitate many of the well-known phenomena of magnets by simple mechanical means. His apparatus consists essentially of an air pump, a few little metal drums provided with elastic membranes, some india-rubber tubing and a small tank of water. The drums are immersed in the water and connected with the air pump by means of the tubing. Pulsations of air are sent into the drums, causing the membranes to expand and contract rapidly, and a very curious result is obtained. If two of these drums are placed in the water at but a short distance apart, and supported in such a way that they are free to swing, and if pulsations of air are now sent into the drums so that the outward and inward pulsations of the membranes of both coincide, the drums will immediately attract each other. If the pulsations are so adjusted that the outward push of the membrane of one drum coincides with the inward pull of the other, the two drums will repel each other. By ingenious modifications of the arrangements various effects are produced, intimately resembling those of magnetic action.

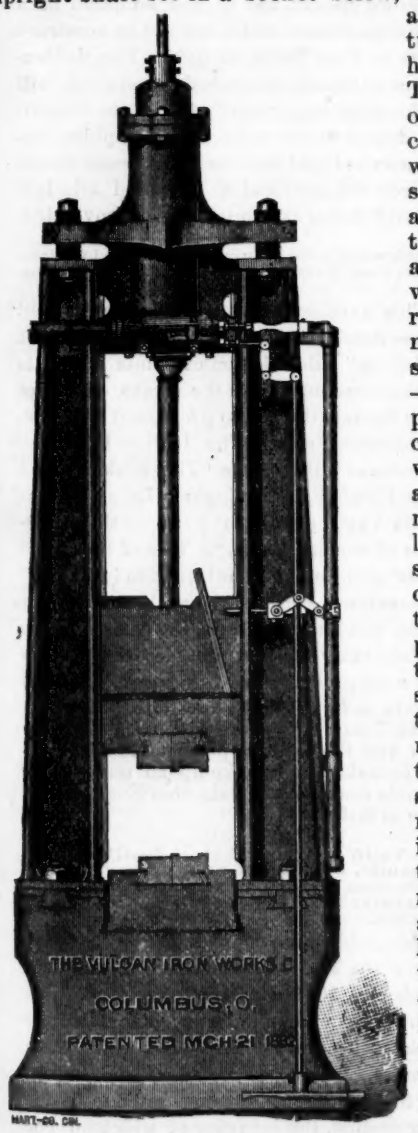
IMPORTANT IMPROVEMENTS IN STEAM HAMMERS.

THE VULCAN IRON WORKS COMPANY,

Columbus, Ohio.

We illustrate to-day two important improvements in steam hammers. The first is a new Steam Drop, and the other a newly improved Steam Hammer. Both are patented and built by the Vulcan Iron Works of Columbus, Ohio.

The enormous growth of drop forging throughout the country in agricultural implements works, carriage manufactories, car shops and innumerable other works has turned the attention of builders to inventing better drop hammers than have been heretofore in use. The Steam Drop we illustrate seems to take the lead. The only difficulties about steam drops have been to control them and prevent them from injuring themselves, and their being continually out of repair. A steam drop is as superior to a power drop as a steam hammer is superior to a power hammer, provided it is brought to the same degree of excellence that ordinary steam hammers possess. An examination of this steam drop will show that the builders have not only succeeded in constructing a fine looking machine, but have gained the more important point we have just mentioned, placing it under such perfect control that it cannot possibly injure itself. The patented valve arrangement is ingenious though simple. At the right of the hammer is an upright shaft set in a socket below, and a collar above so as to turn freely horizontally. The upper end of the shaft is connected with the valve stem so that as the shaft turns back and forth the valve is operated. At the middle of the shaft is a rod —called the push-rod— connected with the shaft and treadle-rod by two links as shown in the cut. When the treadle is pressed the two links are straightened, the push-rod meeting the taper-groove seen in the ram; the shaft is turned and the valve operated. As long as the foot is kept on the treadle, whenever the ram rises to the point at which the push rod is set (it is adjustable for any length stroke desired) the shaft is turned, the valve operated, and the ram descends, when the treadle is released the link motion withdraws the push-rod beyond the reach of the ram, which then remains suspended. This device serves to operate the valve one way, causing the ram to strike its blow automatically. There remains to show the device for operating the valve the other way, and raising the ram after it has delivered its blow. This is very simple. On the opposite side of the ram is another taper groove, similar to the one on front of the ram. Lower down on the shaft is another push-rod similar to the one on front of the hammer, except that it has no link motion. Its connection with the shaft is just visible in the cut. The descending ram at the instant of striking its blow slides back this lower push rod and operates the valve. The ram ascending slides back the upper push-rod as already described, and thus the ram works automatically at a speed corresponding to the pressure of steam, until the treadle being released the link motion withdraws the upper push rod out of the reach of the ram.

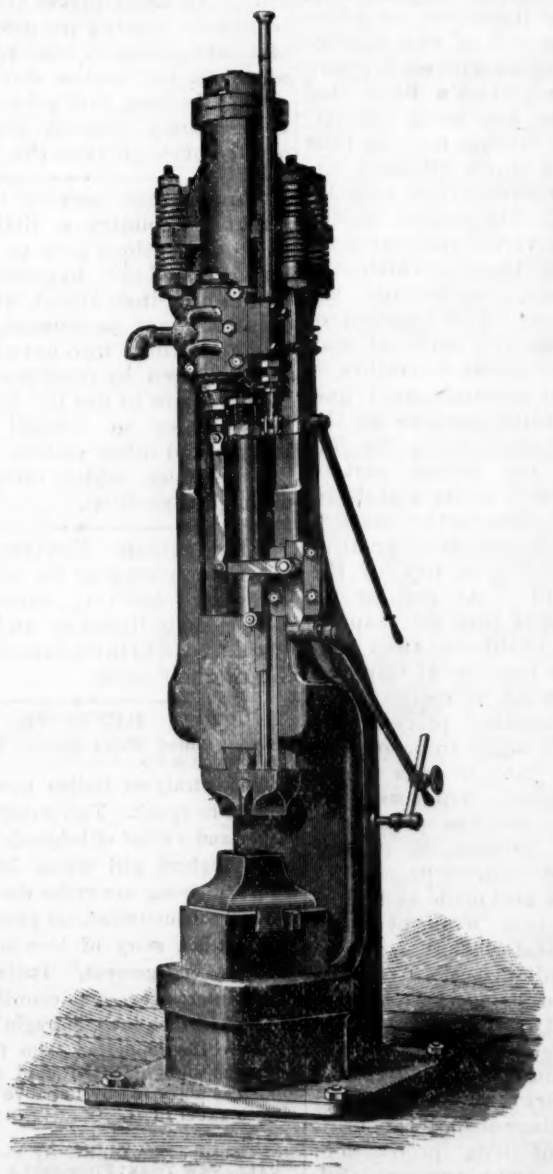


The second and smaller valve chamber seen on the cylinder is the throttle valve which is opened by pressing the treadle and remains open during the operation of the hammer, but when the treadle is released it closes and shuts off the main pressure of steam, admitting only enough to hold the ram up. There are two advantages in this, one being that while the ram starts up quickly, after clearing the work, it rises more and more slowly as the steam is cut off, thus avoiding injury to itself. The other is that while all the valves and packing-rings are made steam tight, there cannot be too many precautions against a waste of steam by blowing through, as is the case with too many hammers. In this way the main pressure of steam is shut off when the hammer is not in actual operation.

Cushioning Springs.

The hammer is further protected by a system of spring cushioning. It cannot receive injury even by inexperienced or careless handling. Even under favorable circumstances the shock and jar while in operation is considerable. The cylinder is suspended in grooved ways between the columns on eight heavy spiral springs, which entirely relieve the cylinder and valve parts from all concussion. There is also inside the cylinder and at the top a heavy spiral spring which cushions the piston in its upward, and imparts a powerful impetus to its downward stroke, rendering the force of the blow fully double. The die-bed is very broad and deep, and is adjustable by keys. It will hold a double set of dies,—a break-down and a finishing die. Three dies have been used, so as to break-down, finish, and cut off the work all at one heat. The size of dove-tail in die-bed and ram, however, varies according to order. The hammer has been in successful operation a year, showing it to be durable, while the number of testimonials and orders the builders have received prove them to be well thought of.

Our second cut shows a 450 pound single steam hammer. The makers build all sizes of this hammer from 350 pounds to 1,200 pounds ram. It has many advantages over all other steam hammers we have seen. We have only space, however, to notice briefly a few. One especial point is that the valve attachments are simple and all placed on the *outside*, and in the front of the frame, easy of access, With the best built machinery it is always made a point to put the working parts as fully under the eye of the operator as possible and ready of access. Another point the builders claim is that they have increased the diameter of the cylinder, and somewhat shortened the stroke, thus rendering the hammer more active and powerful. A short, quick, powerful blow is preferred by blacksmiths to a long, slow one, because the metal cools rapidly while being worked. The cylinder and valve parts are protected from the heavy shock and jar while in operation by the same system of spring cushioning as explained in connection with the Steam Drop. These hammers have been in successful operation for about a year, and seem to have established a good reputation for themselves.



USEFUL RECEIPTS.

CLEANING BRASS.—Large articles of brass and copper which have become very much soiled may be cleaned by a mixture of rotten stone powder (or any sharp polishing powder) with a strong solution of oxalic acid. After being thoroughly cleaned; the metal should be wiped off with a cloth moistened with soda or potash, and a very light coating of oil should be applied to prevent the further corroding action of the acid. A more powerful cleaning agent, because very corrosive, is finely powdered bichromate of potash mixed with twice its bulk of strong sulphuric acid and diluted (after standing an hour or so) with an equal bulk of water. This will instantly clean the dirtiest brass, but great care must be taken in handling the liquid, as it is very corrosive. Brass which has been lacquered should never be cleaned with polishing powders or corrosive chemicals. Wiping with a soft cloth is sufficient and in some cases washing with weak soap and water may be admissible. Dry the articles thoroughly, taking care not to scratch them, and if, after this, they show much sign of wear or corrosion, send them to the lacquerer to be refinished.

A WHITEWASH THAT WILL STICK AND WASH.—We find in a German paper a formula for a wash which can be applied to lime walls and afterwards become waterproof so as to bear washing. Resenschek, of Munich, mixes together the powder from 3 parts silicious rock (quartz), 3 parts broken marble and sandstone, also 2 parts of burnt porcelain clay, with 2 parts freshly slaked lime, still warm. In this way a wash is made which forms a silicate if often wetted, and becomes after a time almost like stone. The four constituents mixed together give the ground color to which any pigment that can be used with lime is added. It is applied quite thickly to the wall or other surface, let dry one day, and the next day frequently covered with water, which makes it waterproof. This wash can be cleansed with water without losing any of its color; on the contrary, each time it gets harder, so that it can even be brushed, while its porosity makes it look soft. The wash or calcimine can be used for ordinary purposes as well as for the finest painting.

PRIMING FOR OIL PAINT.—O. Kall, of Heidelberg, prepares a substitute for boiled oil by mixing ten parts of whipped blood, just as it is furnished from the slaughter houses, with one part of air slaked lime sifted into it through a fine sieve. The two are well mixed and left standing for twenty-four hours. The dirty portion that collects on top is taken off, and the solid portion is broken loose from the lime at the bottom, the latter is stirred up with water, left to settle, and the water poured off after the lime has settled. The clear liquid is well mixed up with the solid substance before mentioned. This mass is left standing for ten or twelve days, after which a solution of permanganate of potash is added, which decolorizes it and prevents putrefaction. Finally, the mixture is stirred up, diluted, if necessary, with more water to give it the consistence of very thin size, then filtered, a few drops of oil of lavender added, and the preparation preserved in closed vessels. It is said to keep a long time without change. A single coat of this liquid will suffice to prepare wood or paper, as well as lime or hard plaster walls, for painting with oil colors. This substance is cheaper than linseed oil, and closes the pores of the surface so perfectly that it takes much less paint to cover it than when primed with oil.

Steel.

Steel is only iron in its best and most valuable form. The chemists once considered that it was a definite chemical compound of iron and carbon, and named it carburet of iron, and it was believed by some that this contained twenty equivalents of iron to one of carbon; but we now know that we may have a steel of a very wide range of carburization, and that (as absolutely pure iron is unknown) all irons, whether wrought iron, cast iron, or "steel," are equally carburates of iron, so long as the carbon is not graphitic. Steel as we may continue to call it, is not more distinctive from other forms of iron than are wrought and cast iron from each other; yet it is the only form of iron which is at once fusible and malleable, and it possesses, besides, the peculiar property of being greatly hardened by being heated and then plunged into water. It is not unlikely that, for all purposes of construction, cast iron and wrought iron will yet become obsolete materials, and useful only for the conversion into the best kind of iron, viz., "steel." And it may happen yet that we shall drop the almost meaningless term "steel," and call it "iron" only. Cast iron might then be described as crude or raw iron, and wrought iron as rotten iron or burnt iron, as it really is—its valuable constituent, carbon, being burnt out to an injurious extent in the toilsome and, indeed barbarous operation of "puddling." Not alone in tensile strength, but in ductility or toughness, steel is now as much better than the wrought iron as the latter is better than cast iron; and steel has the further advantage that it is manageable in castings or forgings of any weight, where, on the other hand, cast iron would be too brittle and too weak, and wrought iron unsafe from the danger of unsound welds and internal crystallization.

Of late years iron, whether known by that name or as "steel," has been growing in strength and adaptability, and it has thus attained qualities which would have been incredible thirty years ago. We now have castings, forgings, rolled bars, rails, wire, etc., made of "steel," which are beyond all comparison, stronger and tougher than iron in any other form known before. It is this wonderful growth of iron, so far as useful qualities are concerned, that has made the metallurgy of steel so popular among non-professional men, thousands of whom are now nearly as well informed upon it as upon those more engrossing questions of ordnance and ship-armor, upon which at least half of all the reading men in the civilized world now hold definite opinions. Bessemer's wonderful discovery turned general attention to the philosophy of iron making, and to the beautiful combinations of which iron is capable and it is now well understood that there are other and not less beautiful analyses to be discovered, which will yet give to iron an intrinsic value, not only greater than that of gold and silver, but far beyond anything now known of the best steel. The great secret of iron cultivation, if we may employ such a term, is crystallization, and this cannot long elude the grasp of the genius of metallurgy; and when we once control the size, form and arrangement of the crystals of iron, in all its stages of conversion, we shall have made it in effect, a new metal.

How Iron is Manufactured.

Iron ores consist of a combination of metallic iron with other substances, such as oxygen, carbon, etc. The iron oxides are known as hematites; then are the carbonates, which include spathic ores, the magnetic ores, etc., etc. All iron ores are more or less impure in the first sense, and the furnace man thinks of them as argillaceous, silicious, or calcerous ores, and mixes them accordingly with each other and with limestone in the proper proportions to promote fusion. It is seldom that ores yield an average over fifty per cent. of metallic iron and probably the general average of all ores worked will not exceed forty-two. The lowest limit of economical extraction is twenty-five per cent., when the ore contains lime and can be enriched by roasting. American furnaces cannot afford to work an average under thirty-five per cent. of iron. The ore is now commonly reduced to a crude metal in what is known as a blast furnace, which may be described as a crucible on a large scale. In its essential details a blast furnace consists of a stack in whole or part masonry, surrounding a verticle chamber or shaft of circular section. The diameter of the shaft usually increases from the top downward and from the bottom upward. The lower part of the furnace is called the hearth, and has the smallest diameter. At its upper part are one or more openings through the blast of air is introduced, and in the lower part or crucible, the molten iron and cinder collect. There are contrivances for drawing off the slag, drawing off the molten metal and finally for clearing out the furnace, if necessary, which need not be described. The blast is supplied through tuyeres (pronounced tweers), from one to eight in number, which are set into the masonry of the furnace. The charge of iron ore, together with a sufficient quantity of coal, coke or charcoal in the flux, which is usually limestone, is introduced into the mouth of the furnace The limestone unites with earthy matter of the ore, and forms a fluid slag or cinder. The fire being lighted, the action of the furnace may be thus described: Air is blown through the tuyeres and comes in contact with incandescent fuel. The oxygen of the air is spedily converted into carbonic oxide gas, which, together with the nitrogen of the air, rises through the descending charge. The reaction of the carbonic oxide and oxide of iron of the ore results in the formation of metallic iron and carbonic acid gas. The latter, ascending, escapes at the mouth of the furnace, while the former descends to the hottest part of the furnace, where it melts and drops into the hearth. The earthy matters of the charge fuse likewise and collect in the hearth, floating on top of the heavier molten iron. At regular intervals the slag and iron are tapped off. The former is thrown away and the latter cast in moulds of sand or iron and forms what is called pigs. These pigs, by another process, are converted into wrought iron, or are melted and run into moulds where castings are required. When wrought iron is made from ore the process is called the direct process, in contradistinction to the indirect process, in which pig iron is first made and afterward converted into wrought iron. It may be here stated that wrought iron was first made directly from the ore, and is still so made where the ore is rich and quality is the principle object. The fires used are called bloomery fires or Catalan forges; but the regular reverbatory furnace has long since taken its place for all the ordinary purposes of iron production. The direct processess are wasteful, but produce superior iron, partly because, the heat being low, impurities are carried off in slag, and partly because the product is usually a low steel. It requires great care to make a soft iron from the ore by bloomery process.

[TO BE CONTINUED.]

THE VALUE OF COAL TAR.—Before the year 1856, the value of coal-tar in London was hardly one cent per gallon, and in most of the English country towns, gas makers were glad to give it away. Up to that time but small quantities of benzine, naptha and crœsote oils had been distilled. In 1856 the discovery of the mauve, or aniline purple, gave great impetus to the coal-tar trade. At the present time, the color trade practically uses benzine, and most of the naptha, and all the anthracine and a portion of the napthaline, resulting from the distillation of coal-tar. It is estimated that, the value of coloring matter so produced is $16,000,000 in England alone. Over 1,000,000 tons of ammoniacal liquor and 95,000 tons of sulphate of ammonia are made, which is worth over $100 per ton. It is said that the by-products of the English gas works exceed the value of the coal used by $15,000,000. It is to this wonderful economy in the utilization of the waste products that the English cheap gas is due. A gas engineer from this country a few years ago, spoke of English gas works as being works for the production of coal tar, ammonia liquor, etc., which sold their gas as a by-product at little more than the cost of producing it. Anxious as the gas makers are to increase the consumption in order to make more profitable portions of the business larger, it seems strange that they have not more generally taken measures for encouraging consumption. In many places the application of gas for heating purposes is difficult, in consequence of the reduced pressure on the mains during the day time. In fact, this pressure is so low as to barely prevent the indraft of atmospheric air into the pipes.

THE signal service is scattering about the country a little phamphlet giving directions how to foretell frost by means of the hygrometer. This is a simple instrument, and as its indications may be trusted, horticulturists and others who have plants liable to be injured by frost would do well to learn how to use it. Unfortunately it is easier to foretell frost than storms and other violent atmospheric disturbances, which often do more damage than frost.

THE Edison Electric Light Co., have manufactured for the Pennsylvania Railroad Co., seven incandescent electric lights as an initial effort of that road to introduce electric lighting on their cars.

REVIEWS.

Leone. (Round Table Series). BOSTON: James R. Osgood & Co.

This is truly an Italian novel, Americanized, so to speak. Two artists, a Capuchin father and a chief of brigands and a bright New England girl whose feelings though deep and strong, are under the control of reason and common sense, are prominent characters. It is a story of love and a pathetic "broken engagement," Italian brigandage being interwoven, and contributing telling incidents which include tragic deaths at the hands of the vendetta. The fair American who was thought to be cold and unimpassioned is absorbed by her love of art and desire to excel in it.

Six Lectures on Light. By Prof. JOHN TYNDALL. NEW YORK: Fitzgerald & Co., 30 Lafayette Place.

As a popular expositor of science, Professor Tyndall holds the very first place, and the work named above is admitedly his masterpiece. A subject of no little difficulty and abstruseness is here treated by him in a style which for clearness of expression and grace of diction challenges the admiration of all lovers of "English undefiled." The work forms a valuable addition to the excellent series of popular scientific books known as the Humboldt Library of Science.

Proceedings of the National Convention of Iron and Steel Manufacturers and Iron Ore Producers at Cresson. PHILADELPHIA: The American Iron and Steel Association

The American Iron and Steel Association has done a good service in republishing in pamphlet form the proceedings of the National Convention at Cresson. The basis of action taken by the manfacturers there assembled is well outlined by the president in the statement that in the proposed revision of the tariff they should act in harmony to secure equal and adequate protection for the labor and capital employed in our various allied industries. No excessive duty should be claimed by any interest. The language of the law should be so clear as not to permit of misconstruction. Ad valorem rates should be replaced as far as possible by specific duties. The premium upon false and fraudulent classifications which have been a fruitful source of injury should be removed by fixing a high rate of duty in ad valorem omnibus clauses, and by the adoption of a similitude clause which can not be construed away by Free Trade officials. The deliberations of the important body assembled will be found to have contributed in an important degree to this end. This pamphlet contains an indexed statement of present duties on iron and steel and a proposed schedule of tariff duties as adopted by the convention.

Blackwood's Edinburgh Magazine for October. NEW YORK; The Leonard Scott Publishing Co.

This number is full of attractive articles. These consist of "Adolphus, a Comedy of Affinities," a description of Tunis which is of the more interest as the Arabs of Egypt have brought the race to prominent attention, the absorbing story, "The Ladies Lindores" is continued; then come "The Erskines and their Kinsfolk," "Nottingham Lace," "Urbas Roma Vale," a spirited poem on the attractions of modern Rome, "A Tale of the Congo Coast" and, finally, "The Situation in Egypt." The reviewer considers that however gratifying to military feelings, the campaign was a misfortune, and that the fact that Russia will most probably insist that concessions to Britain in Egypt will necessitate the revision of the Treaty of Berlin will weigh heavily both with the German powers and with Turkey in making them take up an unfavorable attitude towards any claim that England may have to make.

The Tariff on Iron and Steel Justified by its Results, By JAMES M. SWANK Secretary of the American Iron and Steel Association, PHILADELPHIA: The American Iron and Steel Association.

This publication consists of a paper laid before the Tariff Commission at Pittsburgh, October 10, 1882, and is an able exposition of the views of iron and steel manufacturers on the protection required to further their interests. The rapid growth of the industries they represent is demonstrated to be due to protection, the influence of which on our mining interests and railroad development is traced. It is shown that the prices of iron and steel have been reduced under protection and the cost of transportation decreased. The difficulties in the way of cheap production of iron and steel are clearly expounded, and it is particularly shown how cheap ocean freights are favorable to the foreign manufacturer. Our iron industries in the past are proved to have been injured by low duties and unfriendly decisions and the pernicious effects of ad valorem duties and the fallacy of reducing specific duties to ad valorem equivalents are set forth. The industries of Great Britain are shown to have been built up by protection.

NERVOUS weakening disorders, night emissions and vital drain arising from Indiscretion. Send two 3c. stamps for "Treatise and List of Questions" Address DR. CLEGG, Cleveland, O.

LUBRICATOR LITIGATION.—In a paragraph in our number for July 22 last, it was inadvertantly stated that in the suit of the Detroit Lubricator Co., against a concern styled the American Lubricator Co., the verdict was in favor of the latter. It should have stated just the contrary. The verdict was in favor of the Detroit Lubricator Co, fully confirming and sustaining their rights. The suit was brought in the United States Court, Eastern District of Michigan, Justice Matthews presiding. The patent of the Detroit Lubricator Co., sustained, as above stated, by the court, was granted May 22, 1877, number 191,171. The invention has proved to be very valuable in the economy of the steam-engine, and is being very extensively adopted. Persistent attempts to infringe appear to have been made by the concern styled the American Lubricator Co., who carried the folly so far that they continued their infringments after a verdict and an injunction was obtained against them: the final result being that the principal members of the concern were brought up before Judge Brown, of the United States court, in February last, adjudged guilty of contempt, and fined, besides having to pay costs.—*Scientific American, August 26, 1882.*

MARKETS.

Office of TRADE REVIEW AND WESTERN MACHINIST.

FRIDAY EVENING, October 27.

FINANCIAL.

The money market has ruled easier. The bank rate of discount is 7@8 per cent. Money on call is 5 per cent. and 6 per cent. on 4 and 6 months time on prime collaterals. Receipts of currency have been considerable. Eastern exchange has been in good demand.

NEW YORK.—Stock speculation develops a general and irregular depression of values. Very little has been done in railroad bonds. Of a certain class of bonds very large amounts are waiting for a market, while the demand for any class is very limited There is a more active inquiry for foreign exchange from importers.

IRON ORE.

There is a visible increase in the shipments of ore from this city within the past month, yet business is not altogether satisfactory to a number of holders. No new mills nor furnaces have started up, yet all the coal mines in this district are being worked to their utmost capacity, and several coal firms are selling coal in large quantities to rolling mills and blast furnaces which are now idle. Rumors are current of the "blowing in" of more furnaces at an early date.

IRON.

A moderate business is doing in iron, but prices are firm as the deliveries on contract orders take all of the furnace production. The production of standard brands is reported to be closely sold up a month or six weeks in advance, and with what little is available for prompt or near-by delivery meets with ready sale at full prices. There has been no apparent increase in consumption, and production appears to be evenly maintained so as to leave but little surplus stock. We quote: Foundry No. 1 X, $26@27; Foundry No. 2 X, $24@25; Gray Forge, $22. The demand for foreign iron continues light, but prices are firmly maintained. We quote: Eglinton, $23.50@24; Carnbroe and Glengarnock, $25.50@26; Coltness, $28; Langloan, $26.50@27; and Gartsherrie, $26. English pig is quoted at $22.50; Bessemer Pig entirely nominal at $24 to 25, which is very near the present cost of importation. Scrap is in moderate request with occasional small sales. Mill agents still quote $45 for American steel rails as the basis of all pending negotiations for future delivery, but sales for winter delivery have been made as low as $43. For old rails the market is quiet with little demand. There is a good demand for steel, especially for the low grades. Steel for carriage purposes has fallen off in demand. Prices are steady. In manufactured iron buyers are holding off for lower figures. The mills, however, are pretty well supplied with orders and show no disposition to make concessions. The plate iron market is steady and unchanged. Tubes and pipe are scarce for prompt delivery. Prices of pipe are unchanged at 57½ to 62½ per cent.. according to size; boiler tubes 45 to 47½ per cent. off. Oil well casing 70 cents per foot net; do. tubing 20 cents net.

CINCINNATI.—Reported by Rogers, Brown & Co. —Buying continues in a small way to meet actual wants. Stocks in consumers hands are growing lighter, and the hand to mouth buying is increasing proportionately in extent. Prices range from 50 cents to $1 per ton lower than a month ago. In Pittsburgh and Wheeling the market is half a dollar lower than when the mills resumed work, the accumulation of local stocks acting as a menace and giving buyers a temporary advantage. In charcoal irons there is no change. Foundry work continues active in the cities, but some reports of dullness are heard from the country towns. We quote for cash: Hot Blast Foundry. —Hanging Rock, C. C., No. 1, $26.50 @ $27.00; Hanging Rock, C.C., No. 2, $24.50@$25.50; Southern No. 1, $24.50@$25.50; Strong Coke No. 1, $23.00@$24;00; Strong Coke No. 2, $22 00@$23.00; Strong Coke No. 3, $21.00@$22.00; Soft Stone Coal No. 1, $22.50@23.00; Soft Stone Coal No. 2, $21.00@$22.00; Forge—Strong Neutral No. 1 Mill, $21 00@$21.50; Cold Short No. 1 Mill, $20.00@$21.00. Car Wheel and Malleable — Hanging Rock C. B., $31@$33; Hanging Rock W. B., $25@$27; Southern Car Wheel Iron, $31@$33; Lake Superior Car Wheel Iron, $25@$30; Lake Superior Malleable, $28@30.

CINCINNATI—Reported by E. L. Harper & Co. —The market is temporarily less active, there being that condition of things where buyers are seeking concessions and sellers being able to hold, withstand the influence. It is certain that the output for the prominent furnaces is sold in the main to the close of the year. The mills are very busy and the foundries actively employed. The drought threatening Ohio is curtailing production in the Hocking Valley region. These facts combine to strengthen prices and to render the outlook alike comfortable for producers and consumers.

COPPER.

The market is somewhat inactive. There have been small sales of Lake Ingot at 18 to 18¼ cents, dealers generally asking 18¼, while Baltimore and Arizona brands are quoted 17¾ to 17⅞ cents. London has advanced to £71 10s. for Chili Bars, and £77 for Best Selected.

LEAD.

The market is weaker with moderate sales for forward delivery at 5.05 cents, while in a jobbing way sellers nave obtained 5.10 to 5.15 cents according to brand and delivery. Refined quoted 5.15 cents, with sales at St Louis on this basis but no transactions of importance reported here.

TIN AND TIN PLATES.

Tin has declined both here and abroad. Straits and Malacca have sold at 23⅜c., and Australian has changed hands at 23¼c. There has been a fair jobbing trade in tin plates, mostly in Charcoals and Ternes, and the market closes firm at the following figures, ordinary brands, large lines, per box: Charcoal Bright, $6.25@6.50; ditto Ternes, $5.25@5.50; Coke Tin, $5.20@5.35, and ditto Ternes, $5.20.

SPELTER AND ZINC.

There have been but light dealings in spelter at unchanged prices. Consumers and dealers supply their wants as they arise at about 5¾ to 5¾ cents for Foreign and Domestic brands, while remelted is obtainable as low as 5¼ cents. Zinc is steady at 6¾c.@7c.

ANTIMONY.

Antimony is without change. We quote: Cookson, 13c.@13½c., and Hallett, 10¾c.@11¼c,

HARDWARE.

Jobbers report an improved business. The trade in nails continues good, and prices are firmly maintained. We quote $4 net for 10d. to 60d. There is the prospect of an active trade for the remainder of the year. The Atlantic States Nail Manufacturing Association have confirmed existing prices. There is a good demand for mechanics' tools and builders' hardware. Foreign Hardware is in fair request, and in some lines, particularly fine table cutlery, we are informed that importers are far behind their orders. The tone of the market is steady and values unchanged Sargent & Co., New York and New Haven, Conn., have issued a revised price list and discount sheet for their "Covered" and other Harness Snaps. The changes are in all cases reductions from former figures.

LUMBER.

A steady business has been done, and the general tone is good. There is a good demand for pine and spruce. Quotations on good stock are firm, but concessions are obtainable on coarse lumber. The general belief is that present values will be firmly maintained. There has been a moderate business in hardwoods; choice lots command higher prices, particularly extra dry walnut. Desirable ash is also much sought. Freights as the season draws to a close are firmer.

WOOL.

For desirable lots of Ohio fleece there has been a fair inquiry, at previously quoted rates, and the opinion expressed by holders, is that values will be maintained throughout the remainder of the year. Combing and delaine selections continue to be freely taken, although there have been fewer buyers in market during the past few days and fine delaines have been sold one-half to one cent lower than a fortnight ago. Half blood combings are not plenty and command full rates, some extra choice lots being sold as high as 50 cents, this, however, is above the average of transactions.

LUMBER.

PLANK. MIXED WIDTHS.
2 inch, 12, 14 and 16 feet, together.

A 1 and 2 uppers	$50
A 3	40
B	32
C	20
D	14
E	12

1¼ and 1½ inch.

A 1 and 2 uppers	$48
A 3	40
B select	32
C	20
D	15
E	13

BOARDS.
One Inch, mixed widths.

A 1 and 2 uppers	$44
A 3	36
B select	30
C	19
D	14
E	12

STOCK BOARDS.
12 Inches wide.

A 1 and 2 uppers	$45
A 3	38
B	32
C	21
D	16
E	13

STRIPS.
6 Inches wide.

A 1, 2, and 3	$42
B	32
C	22
D	16
E	12
Norway Fencing Strips	17
Norway Flooring Strips	25

WORKED LUMBER
FLOORING.

Flooring—A 3		$42
	B	35
	C	24
	D	20
Norway Flooring—A 3		28
	C	22
	D	18
Matched Drop Siding, 6 inches—A 3		42
	B	38
	C	24
	D	20

Beaded Ceiling $2 higher than Flooring.

One half inch Bevel Siding—A 1 and 2	24
A 3	20
B	18
Ash Flooring—A 1 and 2	40

BILL STUFF.

Small, joists, 12, 14 and 16 feet	$14
Timber, longer than 20 feet and over less than length.	$4 00@$6 00
Cedar Posts, large	30 00
" " medium	25 00
" " small	$15 to 20 00

SHINGLES, LATH AND MILL WORK

Shingles XXX	$ 4 25
Clear Butts	3 25
Lath	2 75@3 00

Surfacing, one side, adds $1.25; two sides $1 50
Matching, flooring and drop sidings, $2.25.

LAKE FREIGHTS.

COAL.

Buffalo to Chicago	$.62½@.65
Toledo to Chicago	1.00
Cleveland to Chicago	70@75
Erie to Chicago	70@75
Oswego to Chicago	1.50
Fairhaven to Chicago	1.30
Buffalo to Milwaukee	70@75
Cleveland to "	70@75
Erie to Milwaukee	75
Buffalo to Racine	80
Buffalo to Kenosha	85

IRON ORE.

Marquette to Lake Erie ports	1.25
Escanaba to Lake Erie ports	90@95
Escanaba to Chicago	90@95
Marquette to Chicago	1.15@1.20

AIR FURNACE PROCESS.

MICHIGAN MALLEABLE IRON COMPANY:

Manufacturers of

REFINED

MALLEABLE IRON CASTINGS,

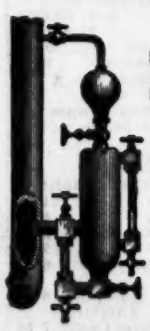
Detroit, Mich.

THE MORGAN

Variable Blast Water Tuyere Iron.

With the front plate removed, showing the rotating air tubes through which four different currents of air may be passed thereby making any sized fire from two to eighteen in. diameter.

It actually saves one-half of the coal; makes an intense heat just where it is needed, and burns no coal unnecessarily Always gives a centre blast, and cleans all the dirt from the fire. Supplies hot water We also furnish a Tuyere on same principle without Water Attachment. All goods guaranteed to please or no sale. Catalogue sent free.
Address, A. W. MORGAN & CO.
52 Vance Block, Indianapolis, Ind.



The Detroit
LUBRICATOR COM'Y'S
Sight Feed
LUBRICATOR
Cups.

For oiling valves and cylinders of steam engines, by the only perfect method, THROUGH THE STEAM PIPE. The oil passes IN SIGHT, drop by drop, into the column of steam where it vaporizes, thus becoming a STEAM LUBRICANT, oiling perfectly every part reached by the steam. Any CLEAN OIL, black or white, light or heavy, may be used. Saves from 50 to 90 per cent. in oil and wear of machinery, thus paying for itself several times a year. A cup will be sent to responsible parties on twenty day's trial if desired. In ordering give diameter of cylinder.

NOTICE

The first Lubricators ever made, showing the oil passing drop by drop through a transparent water chamber, were devised by us, and the same are fully embraced by many Letters Patent owned and controlled by us, which have been sustained in several hotly contested legal contests. Our customers, therefore, need have No FEARS IN THEIR PURCHASE AND USE. We are the sole owners of the "Sight Feed" feature as claimed by us, and we shall hold purchasers and users responsible who are encroaching upon our rights by the unfawful use of our device. Address,

DETROIT LUBRICATOR CO.
Office, 98 Griswold Street, Detroit, Mich.

Note—In our recent suit against the American Lubricator Co., of Detroit, before Justice Stanley Matthews, of the U. S. Supreme Court, involving their "sight-feed" feature, a decree was rendered in our favor August 20, 1881. (Mention this paper)

PURE PREMIUM BONE.

The tried and never failing Fertilizer in all grains and grass crops. It has proved its value as such by years of actual use all over the world. Circulars and Price List free. Address all letters pertaining to the purchase of Premium Bone, or the sale of bones. to Excelsior Fertilizer Works Salem Columbiana County Ohio.

COATES'

"Independent Lock Lever"

HAY AND GRAIN RAKE.

Patented August, 1867, January, 1875, June, 1875, and November, 1876. 60,000 now in use. Light touch of lever and driver's weight dumps it. Best self-dump in market. Twenty steel teeth. No complicated ratchet wheels, friction bands or other horse machinery needed to operate it. A small boy rakes easily twenty acres per day with the Coates' Lock Lever. Send for circulars.
A. W. COATES & CO.
Alliance, Ohio.

W. S. IDE, President. R. T. CLARKE, Manager.

THE

VULCAN IRON WORKS CO.,

Builders of

IMPROVED

Forging Tools,

COLUMBUS, OHIO.

SPECIALTIES:

STEAM DROP HAMMERS,
STEAM HAMMERS,
POWER PUNCHES AND SHEARS AND POWER HAMMERS.

CIRCULARS, PHOTOGRAPHS, AND PRICES FURNISHED ON APPLICATION.

The Vulcan Iron Works Company.

Cleveland Wholesale Prices.

HARDWARE.

Adzes.

Carpenter's.....per doz $18 40
Ship..... " " 18 75
Heavy railroad.... " " 19 50

Axes.

Hunt's.....₰ doz $ 9 50
Lippincott's Crown.₰ doz 9 00
Cut More.₰ doz 9 00
Peck's Double Bit..₰ doz 22 00
"Champion Blade ₰ doz 11 00

Anvils.

Eagle, Amer...per lb. 10c dis 20
Wright's.....10¾c@11c
Armitage's Mouse Hole 9¾@9¾c
Trenton.....10¾c
Wilkinson's.....10¾c

Anvil Vise and Drill.

Millers Falls Co. $28.....dis 20
Cheney Anvil and Vise.dis 25&2

Vises.

Solid Box, list of July 1, '79, dis 35
Solid "Crown" (A. H. Hildick).....40 to 100 lb. 15c net
Solid, Peter Wright's.....15⅛
Solid, Wilkinson's.....13½
Parallel, Parker's.....dis .0
Saw Filers, Hopkins'
₰ doz $17.50, dis 10
Reading.....dis 45&10
Lowell Hand Vises.....dis 20
Richardson's Vise and Anvil.....dis 25

Augurs and Bits.

C S cut augers.....dis 40&10
do do do bits.....40&10
D C gimlet do Ives....dis 50
Snells bits.....dis 40
Russell Jennings' augers dis 16⅔ &10&10
Cook's pat augur.....40&10

Animal Pokes.

Berea, per doz.....4 00
Eagle, per doz.....5 00

Apple Parers.

Domestic & Reading ₰ doz.$7 50
Turn Table.....00

Bolts.

Machine.....dis 60
Bolt ends.....dis 60
Plow.....dis 50
Plow, R. B. & W.....dis 40
Cast Iron Barrel Shutter, etc.....dis 50 &10
Cast Iron Chain (Sargent' list).....dis 60&10
Ives' Pat. Door Bolts..dis 50
Wrought Barrel.....dis 55&10
Wrought Square.....dis 55&10
Wr'g't Shut'r, all iron, Stanley's list.....dis 50&10
Tire, R. B. & W., new list.....dis 70&10
Stove, American Screw Co.'s.....dis 40
Bolt Ends.....dis 60

Bellows. Dis

Blacksmith's com new list, 45₰ct
Moulder's new list, dis 25 ₰ cent
Hand, new list, 25 per cent

Butts. Dis

Wrought brass.....65&10
Cast, loose joint.....55
Pin, loose.....50
Wrought, fast joint narrow.....45
Wrought fast joint broad.....45
Wrought loose joint broad.....55
Wrought table and back flaps.....45
Loose joint, without acorns.....55
Ten per cent. extra dis for cash.

Cleveland Stamped Elbows

Genuine Russia Iron

4 inch per doz.....4 50
4¼ do do.....5 50
5 do do.....7 50
5½ do do.....8 50
do do.....9 50
do do.....11 00

Planished American Russia Iron

inch, per doz.....4 00
4½ do do.....5 00
5 do do.....6 50
5½ do do.....7 50
6 do do.....8 50
do do.....9 50

Charcoal Iron

4 inch, per doz.....2 00
4½ do do.....2 50
5 do do.....3 50
5½ do do.....4 00
do do.....4 50
do do.....5 50
25 per cent

Chisels.

Hot and cold cutting.....₰ lb 30
Railroad track.....30
Machinists.....30
Mallet head.....50
Tape.....50
Packing.....50
Stone cutters.....50

Crowbars.

Cast steel.....₰ lb 8½
Iron, steel points.....6½c

Cutlery, Pocket and Table.

Meriden Cutlery Co, table..net
Am. Miller Bros.' Cutlery Co.....dis 25
Humason & Beckley, pocket 33⅓
Naugatuck Cutlery Co...list net
Aaron Berkenshaw's pocket dis 25

Coopers' Tools.

Bradley's.....dis 14@2
Barton's.....dis 20

Chains.

Coil by cask.....

3-16	¼	5-16	⅜	7-16	½
10¾	9	8	7	6¾	6¼

Drills and Drill Stocks.

Blacksmiths', each...$2.50 dis 10
Blacksmiths', self-feeding, each 7.50 dis 20
Breast, P. S. & W.....dis 20&10

Drawing Knives.

Witherby's.....dis 65@10
Nobles Mfgr. Co.....15
Adjustable handle.....20

Emery and Emery Paper.

Regular Numbers.....₰ lb 6c
Flour and F. F.....₰ lb 4c
B. & A. Emery Paper..dis 30&5

Enameled and Tinned Ware.

Kettles.....dis 50
Sauce Pans.....dis 25
Tinned Sauce Pans.....dis 50

Files.

Auburn.....$5 to £, dis 35 pr cent
E. M. Boynton's, new list..dis 25
J. & Riley Carr.....4.50 to £
Johnson & Bro.....dis 30
Butcher's.....4.50 to £
Walter Spencer & Co.'s "Diamond".....4.50 to £.
Fisher's.....4.75 to £
Moss & Gamble.....4.50 to £.
H. Disston & Sons (new list).....dis 40 per cent
Heller Bros.' Horse Rasps dis 25
Nicholson.....dis 40
New American.....dis 40
Union File Co.....dis 40

Grindstones.

Ohio.....1¼@1½ ₰ lb
Nova Scotia.....1¼@1½ ₰ lb

Hammers.

Maydole's.....dis 15
Cheney's.....dis 25
Hartford Hammer Co.....dis 20
Humason & Beckley.....dis 50
Verree.....dis 5
Magnetic Tack. Nos. 1, 2, 3, $1.25, $1.50 and $1.75, dis 25&10
Nelson Tool Works...dis 40&10
Warner & Noble's.....dis 5
Kip's.....dis 15
Yerkes & Plumb.....dis 15
Wilkinson's Smiths' 11½c ₰ lb net

Hatchets.

Yerkes & Plumb:--Shingling,
Nos. 1, 2, 3,
₰ doz $7 50, $8 00, $8 50, dis 25
Claw,
Nos. 1, 2, 3,
₰ doz $8 25, $8 75, $9 25, dis 25
Lathing,
Nos. 1, 2, 3,
₰ doz $7 50, $8 00, $8 50, dis 25

Nails.

10 to 60d.....$4 00
8 and 9d.....25
6 and 7d.....50
4 and 5d.....75
3d.....1 50
2d.....2 75
3d fine.....3 00
2d fine.....3 75
⅞ inch.....3 00
4d barrel.....1 00
1¼ inch barrel nails.....1 50
1¼ do do do.....1 75
1 do do do.....2 50
⅞ do do do.....3 00
Cut spikes, all sizes.....25
Clinch nails, all sizes.....1 75
Casing and box nails 75 cts advance
Finishing nails, $1 25 do
Tobacco nails, 50 cts do

Nuts and Washers

Nuts, square.....7c off list.
Nuts, hexagon.....6c. off list.
Washers.....6c off list.

Picks.

Railroad, 4 to 5 lbs...doz $7 75
5 to 6 lbs.....7 75
to 7 lbs.....8 50
7 to 8 lbs.....9 50
Railroad Tamping Pick.....7 to 8 lbs..doz 13 50
Mill Picks per lb.....75c

Rivets.

Iron.....dis 40
Tinned.....dis 40
Copper.....dis 33⅓

Squares. Dis

Steel or iron, case lots.....50
Try squares and T bevels.....40

Spikes—WROUGHT

All lengths by ¼ inch.....4½c
do do do 5-16.....3½
do do do ⅜, 7-16 & ½in 3¼

Shovels and Spades.

Ames' new list, July 1, 1881.....dis 15
Old Colony.....dis 15
Remington's (Lowman's Patent).....dis 30
Rowland's.....dis 40 and 10
Griffiths.....dis 40&10

Saw Sets.

Boynton s patent X Cut, per doz $12; Hand Saw, per doz $10.....dis 20
Stillman's Genuine, per doz $3 50 and $5 50.....dis 20
Stillman's Imitation, per doz $3 25.....dis 20&10
Common Lever, per doz $2 dis 30&10
Leach's No. 0 $8; No. 1 $15; dis 15
Hammer, Hotchkiss $5 50, dis 10
" Bemis & Call Co.'s new patent.....dis 40&5
Bemis & Call Co.'s Lever and Spring Hammer..dis 30&5
Bemis & Call Co.'s Plate..dis 10
" " Cross-cut dis 12½
Aiken's Genuine...$13, dis 50&10
" Imitation.....$7, dis 50
Hart's Patent Lever.....dis 20
Disston's Circular.....dis 40

Sad Irons.

From 4 to 10 lbs....per lb 8¾ net
Self-Heating.....₰ doz $9 net
Tailors..₰ doz $18 net
Gleason's Shield and Toilet.....dis 25
Mrs. Pott's Irons, double pointed.....dis 35
Mrs. Pott's Irons, square back.....dis 35
Enterprise Star Irons.....dis 40
Combined Fluter and Sad Iron.....₰ doz $15, dis 15

Scales.

Hatch, Counter, No. 171 ₰ doz. $42, dis 37½&10
Union Platform.....$6, dis 45
Fairbanks'.....dis 20
Buffalo Scale Co.....dis 20&5
Forsyth Scale Co.....dis 25
Howe's.....dis 20&10
Chatillon's Eureka.....dis 25
Family Universal.....dis 50
Scale Beams.....dis 33⅓&10

Bag Holders.

Sprengle's Pat, $18.00 per doz 40 per cent. dis.

Planes.

Ohio Tool Co.....dis 25
Sc ota.....dis 30
Bailey's Pat. Adjstble..dis 20@25

Rules.

Stanley.....dis 66⅔ and 10

Sash Locks. Discount.

Payson Mnfg. Co. "Perfect"..42
Simmons' Sash Supporters...20

Hinges.

Champion double acting spring hinges.....dis. 30
Screw & Strap 8@12 in.....$6. net
Gravity Locking Blind Hinges, Sargeant & Co. 70&10

Screws. Dis

Flat head iron or steel per cent dis.....30
Flat head brass.....30
Round head iron or steel..25
Round head brass.....20
Brass and Silver capped.....40
Japanned, list of Plain Screws.....20
Coach, patent Gimlet point, list per 100.....60
Lag, taper points.....60
Bed.....10
Machine, flat head, iron.....55
round head, iron.....50
Bench, iron.....55&10
wood, beech, per doz $3.....10
wood, hickory.....20&10

Valves. Dis.

Jenkins' Patent Gate Valves..35
" " Globe " ..40
" Standard Packing " ..20

Wrenches.

Coe's genuine.....40 & 10
Coe's imitation wrought bar..60
Mechanics'.....60 and 10

Wire.

Brass and Copper.....dis 20
Bright & annealed, Nos. 0 @ 18 dis 50@52½
" " Nos. 19 @ 36 dis 60
" Nos. 37 @ 36 dis 65
Coppered Nos. 0 @ 18, dis 45
Galvanized, Nos. 0 @ 18, market list,.....dis 40
Tinned, Nos. 0 @ 18,.....dis 40@45
Cast steel.....dis 40
Tinned Broom Wire, Nos. 18 @ 25.....dis 55
Annealed Fence, Nos. 8 and 9.....dis 55@52½
Annealed Grape, Nos. 10 to 14.....dis 52½
Galvanized Telegraph, Nos. 7 to 9.....₰ lb 7½c
Galvanized Telegraph, Nos. 10 to 11.....₰ lb 8½c
Galvanized Telegraph, No 12.....₰ lb 10½c
Fence staples.....₰ lb 5½@5¾c
Fence Staples, galvanized, ₰ lb 7@7½c
Stubs Steel Wire.....$7 00 to £
Barb Wire, painted.....8½c
Barb Wire, galvanized.....9¼c
Crucible Steel Ropes from ¾ in. at 9c to 1¼ in. at.....52c
Best Selected Iron Ropes from 3-16 in. at 3c. to 1¼ in. at.....33c

Boiler Plates.

("Gaylord"--Standard Quality.)
C. No. 1.....4 50
C H. No. 1 Shell.....4 75
C. H. No. 1, 50,000.....5 25
C. H. No. 1, 55,000.....5 75
C. H. No. 1 Flange.....6 50
Firebox.....
T. S., 60,000.....(as per)..6 50
T. S., 65,000.....(act of)..
Homo. Steel, 70,000 (of Cong).7 50
Heads, ½c ₰ lb. extra.
N.B.—Eastern brands of boiler plate at from 2-10 to 3-10c ₰ lb less than above prices.

Sheet and Tank Rivets. "Norway."

All sizes.....dis. 15

Boiler Rivets—"Albany."

⅜, ½, 11-16, and ¾ in. diam.5 50

Boiler Makers' Tools.

Doty's Power Shears....net list
" Hand Lever Shears.net list
" Power Punch.....net list
" Hand Punch.....net list
Steel Screw Punch.....net list
Iron Screw Punch.....net list
Boiler Plate Rolls.....net list
Buffalo Forges & Blowers dis 20
Watson's " " net list
Spring Tube Expander....dis 15
Roller Tube Expander..net list
National Tube Cleaner...dis 20
Wire Flue Brushes.....net list
Anvils—"Peter Wright" 12½ ₰ lb
Solid Box Vises.....net list

Nuts, Bolts, etc.

Square & Hex. Nuts....7 off list
Washers.....list
Machine Bolts.....dis 60
Bolt Ends.....dis 60
Boiler Patch Bolts.....net list

Boiler Tubes.

"National" Standard Gauge 1 inch to 10 inch.....dis 37½
"National" Standard Gauge 11 inch to 15 inch.....dis 25
"National" Special Locomotive Tubes.....net list

IRON AND STEEL.

Flat Bar.

1½ to 4 by ¼ to 1 inch.....2 50
4¼ to 6 by ¼ to 1 inch.....2 60
1¾ to 6 by 1¼ to 1½ inch....2 90
1¼ & 1½ by ¼ to ½.....2 60
1 & 1½ by ⅝ to ½.....2 70
⅝ ¾ and ⅞ by ⅜ to ½.....2 90

Round.

1 to 1⅜ inch.....2 50
2 to 2⅝.....2 70
2¾ to 3¼.....3 00
3½ to 4.....3 50
4¼ to 4½.....4 00
4¾ to 5.....4 20

Square.

1 to 1⅜ inch.....2 50
2 to 2⅝.....2 70
2¾ to 3¼.....3 00
3½ to 4.....3 50
¼ to ½.....2 60

Heavy Band.

1¾ to 6 by ¼ and 5-16 inch. 2 70
1 to 1¾ by ¼ and 5-16 do 2 80
¼ to ⅝ by ¼ and 5-16 do 3 00
⅝ to ½ by ¼ and 5-16 do 3 50

Half Oval and Half Round.

Wagon box iron ¼ and ⅜.. 4 00
1-10c per lb extra will be charged for cutting to specified lengths

Light Band.

1¾ to 6 by ⅛ to 3-16.....3 00

Hoops.

1¼ to 2, Nos 16 to 18.....3 40
1¼ to 4 do 13 to 15.....3 30
1-10 extra for each gauge lighter

Sheet Iron.

No 22 to 24.....4 50
No 25 to 26.....4 70
No 27.....4 90
No 28.....5 30

English Steel.

Best cast.....₰ lb 15½c
Extra cast.....16½c
Round machinery, cast.....10c
Swaged, cast.....18c
Best double shear.....15½c
Blister, 1st quality.....13c
Refined tool steel.....16½c
Spring calking.....7¼@7½c
German steel, best.....11c
2d quality.....10c
3d quality.....9c
Sheet cast steel, 1st quality.....15½c
2d quality.....14½c
3d quality.....12½c

American Steel.

Best brands of refined cast steel, ⅜ to 2 inches....12c
Crucible cast.....7c
Open-hearth ditto.....4½c
Hammer cast steel.....9c
Spring cast steel.....7½c
Bessemer and open-hearth spring.....5c
Ditto plow.....4½c
Steel boiler plate.....6½@7c
Bessemer machinery...5 @6c
Spring and calking.....7¼@7½c
Tire.....5
Sleigh shoe.....5

Bessemer Steel Tire.

⅝ to 1 by 3-32.....4½ ₰ lb
⅝ to 1 by ¼ to 5-32.....4½ ₰ lb
⅝ to 1 by 3-16 to ⅝.....4¾ ₰ lb

Miscellaneous Cast Steel.

Auger and auger bit.....1
Axle steel for wagons.....7
Frog points and plates.....8
Frog size bars.....8½
Pick, hammered.....10
Mattock, beveled.....9
Table cutlery.....7½
Trap spring steel.....10
Pike and cant hook.....9
Coal and granite.....8½

TINNER'S STOCK.

Tin.

Banca.....per lb. 26c
Straits.....26c
English.....27c
Bar.....27c

Tin Plate.

IC 12x12 charcoal.....$ 6 50
IC 14x20 do.....6 25@6 50
IX 14x20 do.....8 25
DC 12½x17 do.....6 00
DX 12½x17 do.....8 00
DXX, 12½x17 do.....10 00
DXXX, 12½x17 do.....12 00
IC, 20x28 do.....14 50
IX, 20x28 do.....15 50
IC, 14x20, Best Roof.....6 00
IX, 14x20, do.....8 00
IC, 20x28 do.....13 00
IX, 20x28 do.....14 50
IC, 10x14 Best Coke.....5 75

Solder.

Half and Half, in bars.....15½
No. 1 do.....14½
Spelter Solder.....25

Pat Planished Sheet Iron.

[A].....per lb 10½c
[B].....9½c

Nos	10 to 14	15 to 20	21 to 24	25 & 26
Com	3-60	3-80	4-00	4-20
Char	5-60	5-80	6-00	6-20

Sheets over 28 in. wide ½c extra

Zinc.

Sheet, cask.....8c
Sheet, open.....8@ 8½

Tinners' Tools & Machine

Machines (P. S. & W.) list add 20
Tools (P. S. & W.).....add 6

Plumbers', Steam and Gas Fitters' Supplies.

Wrought Iron Pipe.....dis 60.
Steam Brass Goods.....dis 45
Water " .....dis 40
Enameled Pipe.....di 65
Artesian Well Casing...net list
Hydraulic Tubes.....net list
Malleable Iron Fittings..net list
Cast Iron Fittings.....dis. 45
Globe Valves.....dis. 35
Angle Valves.....dis. 35
Check Valves.....dis. 45
Safety Valves.....dis. 35
Ludlow Gate Valves....dis. 20
Ball Gauge Cocks (net per dozen).....$15
Compression Gauge Cocks dis. 35
Montg'ry Gauge Cocks...dis. 35
Register Gauge Cocks (net per piece).....$1 00
Cylinder Cocks.....dis. 30
Air Cocks (net per dozen)...$2 75
Oil Cups.....dis. 30
Steam Gauges.....dis. 40
Water Gauges.....dis. 40
Scotch Glass Tubes.....dis. 50
Steam Whistles.....dis. 45
Pipe Tools.....special
Globe, Angle and Check Valves (Star's regrinding).....dis. 25
Duplex Injectors.....net. 20
Soil Pipe & Fittings.....dis. 20
Sinks.....dis. 25
Bath tubs' &c.....dis. 20

Babbitt Metal.

Babbit Metal, No. 4.....8c
Babbot Metal, A No. 1.....12c
Babbit Metal, J. B.....85c
Babbit Metal, genuine.....35c

LEAD.

American, ₰ lb.....5½c
Bar, ₰ lb 6½c dis 10 per ct
Pipe, ₰ lb 7½c dis 10 per ct
Sheet, ₰ lb..8c dis 10 per ct
Tin-lined pipe ₰ lb 15c dis 10 pr ct
Shot Drop 7c; Buck.....7c
Chilled Shot.....8c

COPPER.

Lake Ingot.....18@18½c
Baltimore.....17½@17½c
Arizona.....17½@17½c

Sheathing Braziers Copper, Bolts, &c.

Brazier's Copper, ordinary sizes, 16 oz. per sq. foot, and over per lb.....30c
Brazier's Copper, ordinary sizes, under 16 oz. and over 12 oz. per sq. foot, per lb. 32c
Brazier's Copper, 10 oz and 12 oz per sq ft.. per lb. 34c
Brazier's Copper lighter than 10 oz. per sq ft.. per lb. 36c
Circles less than 84 inches in diameter.. per lb. 33c
Circles 84 inches in diameter and over.....per lb. 30c
Segment and Pattern sheets per lb. 33c
Locomotive Fire Box sheets per lb. 30c
Sheathing Copper, over 12 oz per sq. ft.....per lb. 28c
Bolt Copper.....per lb. 30c
Copper Bottoms..per lb. 31@32c
No copper is Sheathing except 14x10 inches, and not to exceed 34 oz. to the sq. ft.

Tinning.

14x18.....per sheet 6c
All other size sheets, 2½c per square foot For tinning both sides, double the above amount.

SCRAP IRON AND OLD METAL

DEALER'S SELLING PRICES.

Net Tons.

No. 1 wrought scrap.....$24
Sheet and hoop " .....10@11
Cast scrap, (No. 1 heavy).19
Cast Scrap (Stove Plate).12

OLD METALS.

Old copper per lb.....15c
No. 1 H. Brass per ₰.....14
Heavy yellow Brass do.....12
Light Brass per ₰.....8
Scrap Zinc per ₰.....3½
Tea Lead per ₰.....4
Heavy Lead per ₰.....3

PIPE, WROUGHT.

Standard Wrought Iron Lap Welded Steam and Gas

Inside Diameter. Inches.	Plain, Price Per Foot.	Galvan. or Enameled Per Foot.	Outside Diameter Inches.	Weight Per Foot.
⅛..	08		.40	.24
¼..	08	$0 11	.54	.42
⅜..	09	12	.67	.56
½..	11	15	.84	.85
¾..	13½	19	1.05	1.13
1..	19	28	1.31	1.67
1¼..	27	40	1.66	2.26
1½..	33	47	1.90	2.69
2..	46	64	2.37	3.66
2½..	75	1 00	2.87	5.77
3..	95	1 30	3.50	7.55
3½..	1 25	1 70	4 00	9.05
4..	1 50	2 05	4.50	10.73
4½..	1 75	2 40	5.00	12.49
5..	2 25	3 00	5.56	14.56
6..	2 75	4 00	6.62	18.76
7..	3 75	....	7.62	23.00
8..	4 75	....	8.62	28.00
9..	6 50	....	9.68	34.40
10..	8 00	....	10.75	40.64
12..	12 00	....		54.65

Discount, 62½ per cent; galvanized, 62½ per cent.

BRASS.

Cash prices for Roll and Sheet Brass. For less quantity than 100 lbs. add 3c per lb.

High Brass

All Nos not thinner than No. 28, wider than 2 in. not wider than 14 inch.....30c
All Nos. to No. 28, inclusive, and widths over 14 to 20 in. inclusive.....35c
All Nos. to No. 28, inclusive, and widths over 20 to 30 in. inclusive.....38c
½c per lb. advance on each No. above Nos. 28 to 38, inclusive.
All Brass thinner than No. 8 is Platers' Brass at.....53c
Sheets 24x48, and all sheets cut to particular sizes and lengths under 30 inches, in width wider than 2 inches.37c

Low Brass.

4c per lb. more than High Brass.
Gilding metal 8c per lb. more than High Brass.
Platers' or Gold Metal
In Bars.....48c
Sawed.....51c
Planed or Polished..54c

For Slitting.

Metal in width in. to ⅜ in. to No. 28, inclusive, 1c per lb. advance.
Metal, in width 2 in. to 1 in., thinner than No. 28, 2c per lb. advance
Metal, in width ⅜ in. to ¼ in. thinner than No. 28, 5c per lb. advance.
Metal ¼ in. in width and less, 10c per lb. advance.
Any of the above widths cut to particular lengths, add 7c per pound.

COAL,

WHOLESALE.

Wholesale f.o.b. vessel at Cleveland:

Carbon Hill and Monday Creek.....$2 65
Massillon.....2 75@ 2 85
Brier Hill.....3 25@3 75
Pittsburgh.....3 00
Saline ville.....2 25
Tuscarawas.....2 25

RETAIL.—Delivered.

Massillon Lump.....$4 00
" Nut.....3 75
Carbon Hill and Monday Creek, lump.....3 75
Carbon Hill and Monday Creek, nut.....3 50
75c less on cars by car load.
Anthracite Stove and Chestnut.....7 15
Egg and grate.....6 00

GLASS.

(Per box of 50 feet)

SINGLE THICKNESS

6x8 to 10x15.....
11x14 to 15x24.....8 50
16x24 to 20x28.....9 75
15x34 to 24x30.....10 75
26x28 to 24x36.....11 50
26x36 to 26x44.....13
26x46 to 30x50.....14 00

DOUBLE THICKNESS

6x8 to 10x15.....11 7
11x14 to 15x24.....13 25
16x24 to 20x28.....15 75
15x34 to 24x30.....17 25
26x28 to 24x36.....18 50
26x36 to 26x44.....21 25
30x50.....22 50
30x52 to 30x54.....23 25
30x56 to 34x56.....25 00
34x58 to 34x60.....27 75
36x60 to 40x60.....30 00
Dis 60 & 15 single, 60 & 20 double

OILS.

Pure Oils. packages included

Sperm, winter bleached per gal.....1 25
Whale, winter bleached per gal.....63
Straits.....50@53
"A" oil for tanner's use 35 @40
Lard oil extra W S....1 03@1 10
do No 1 do.....82@87
do No 2 do.....72@77
Tallow oil.....75
Neatsfoot oil pure.....90@95
do No 1.....80@85
Linseed oil, raw.....54
do do boiled.....57
Cotton seed oil white..64 @ 66
do do yellow 60 @ 63
West Virginia lubricating 28 deg.....20c@30c
Pure Mecca.....55@ 50
Paraffine oil winter pressed.....25@ 30
Machinery.....40
Engine.....50
Miners' oil.....40@45
Drilling oil.....40

Hides and Leather.

Prime cured hides.....8¾@9
Green hides.....5@6
Bull, scrubby, badly scored or damaged, cured, two-thirds price.
Prime dry hides.....13@14
Horse hides, green....No. 1, $2 00
Prime cured veal calf, 12@12½
Ohio Deacon S, salted.....60
Pelts, wool on.....25@30
Fresh slaughter sheep 30@$1 50
Fresh slaughter lambs 50@60
Green calf skins.....13
Hemlock rough.....22@24
Oak harness.....34@38
Oak sold.....27@40
Union harness.....31@

Cleveland Business Directory.

Assayers and Analytical Chemists.

JUDSON, W, E, Ana ytical Chemist, 8 Cushing Block.

Bolt and Nut Works.

HOTCHKISS & GAYLORD, manuf'rs. Machine, Plow & Elevator Bolts, Coach Screws.

Boiler Makers.

SMITH & TEACHOUT -- (Established 1857.) Boiler, Tanks, Stills etc. 439 Broadway.

Bridge Builders.

BUCKEYE BRIDGE AND BOILER WORKS mfrs of Arch & Truss Bridges, Boiler Tanks and Oil Stills. Bet. Wasson St. and Case Ave.

Coal and Iron Exchange.

JACKSON IRON CO. Iron Ore and Pig Iron. Rooms 8 and 9. Fayette Brown, Gen. Agent.

RHODES & CO. Coal, Iron Ore an Pig Iron. Rooms 1 and 2.

Carriage Blacksmith.

STRIEBEL, CHAS. manfac'r. of Carriages and Wagons and platform trucks. Horse shoeing and general blacksmithing .93 Woodland ave.

Carriage Bolts.

THE COLWELL & COLLINS NORWAY BOLT CO., manufacturers of Philadelphia Carriage and Tire Bolts.

Church and School Furniture.

FAULHABER, GEO. manufacturer of School and Church Furniture. Fine Hard Wood work a specialty. 203 Ontario Street.

Custom Boots and Shoes.

ROONEY, JOHN manufacturer of hand-made Boots & Shoes, custom made and warranted 177 Ontario Street.

Carriage Repository.

GREENE'S, J. O., Carriage Repository, 408 Superior street and 52, 54 & 56 Rockwell street, dealer in Fine Carriages. Repair shop in connection.

SLATER. G. A., Carriage dealer, sells the best work for the lowest price. A fine assortment always on hand; Repository 365 Euclid Avenue.

Coal and Pig Iron.

ANDREWS, HITCHCOCK & CO., Briar Hill Coal and Pig Iron. 122 Water Street.

Electrical,

ELECTRIC SUPPLY CO. manfrs and dealers in Electric Burglar Alarms, Annunciators, Cell Bells and Batteries. Telephone lines built and repaired. 145 Seneca Street.

Fresco Artists.

KEMMER & KUSHMAN DECORATIVE CO., Fresco Artists, Fine Modern Wall Papers. 338 Euclid ave.

Foundries.

BOWLER & CO., Car Wheels, Patent Chilled Frogs, and all kinds of castings. 9 Winter.

CLEVELAND MALLEABLE IRON CO., manufacturers Malleable Iron Castins.

LAKE SHORE FOUNDRY, Water and Gas Pipe, Light and Heavy Castings. Alabama st.

TAYLOR & BOGGIS, successors to H. & H. F. Taylor, Iron Founders, 65 to 73 Central Way.

FITZSIMONS WM. & SON, Rolling Mill and Machinery castings. Rolls a Specialty. No. 435 Broadway.

File and Saw Works.

PARKIN, W. H. & CO., Hand-cut Files and Rasps, dealers in Disston's saws, 11 So. Water

Flue Cleaner.

CLEVELAND FLUE CLEANER M'F'G. CO. manufacturer of Aitchison & Doolittle's Patent Steam Flue Cleaner, 22 & 24 Power Block.

Hotels.

FOREST CITY HOUSE, cor. Public Square and Superior st., Terrill & Ingersoll, Props.

KENNARD HOUSE, D. McClasky, Prop.

NEW ENGLAND HOTEL. Water st., W. W. Wolcott, Prop. Refitted and refurnished.

STRIEBINGER HOUSE, between Ontario and Seneca sts. $2.00 per day. Hawley & Langton

CITY HOTEL, Seneca street. H. B. West, proprietor. $1.50 per day.

Hides, Pelts and Leather.

DENNISON BROS., dealers in Hides, Pelts, Furs and Tallow, 48 and 50 River street.

Hardwood Lumber.

MARTIN, J. T. dealer in Hardwood Lumber, Stone's Levee, near Central Way.

Lumber.

WOODS, PERRY & CO., manufacturers and dealers in Lumber, Lath, etc., 5 Carter st.

FISHER, WILSON & CO., wholesale lumber dealers (pine & hard wood), rough and dressed umber, timber, lath, shingles, etc. 47 Central Way

KRAUSE, C. A., & SON, wholesale and retail dealers n lumber. Yards cor. Superior and Wason and 281 Merwin streets.

Cleveland Business Directory.

Hardware and Iron.

BINGHAM, WM. & CO., Hardware, Iron, Nails and Metals, 148 and 150 Water street.

CLEVELAND ROLLING MILL CO., manuf'rs. of Steel and Iron Wire and Steel Tire.

WORTHINGTON, GEO. & CO., Hardware and Dealers in Metals. Water street.

Lime Manufacturers.

RUSSELL LIME CO., manufacturers of White Lime; also dealers in Plaster, Cement, etc. 85 Elm street.

Machinery and Boilers.

CLEVELAND STEAM FURNACE CO., Engines and Boilers, cor. Detroit and Center sts.

KRITCH, K. E. Metal Pattern Maker. Small machinery repaired. Lawn Mower sharpening a specialty. 42 South Water Street.

Machinery Depot.

CLEVELAND MACHINERY DEPOT, (now National Machinery Depot.) The largest stock of New and Second-hand Engines, Boilers and Machinists' Tools. Shop and Warehouse corner Bond and Superior streets.

Mercantile Agency.

THE MERCANTILE AGENCY. R. G. Dun & Co. proprietors. 121 Superior street.

Oil Manufacturers.

AMERICAN LUBRICATING OIL CO., manufacturers of lubricating oils. 23 Euclid ave.

Pattern and Model Makers.

WHITTINGHAM, J. & C., Metal Pattern and Model makers 52 Canal Street.

REID, J. C., Pattern and Model Maker. 52 Canal Street., (Up Stairs.)

COTTRELL & CO., W. L., Pattern Makers, 53 Center street.

STAIR BUILDER.

PFEIL, CHAS. Stair Builder; Hard Wood Mantles and Office Railing. Works, 49 & 51 Canal street, Cleveland, Ohio

JOHNSON & PURSER, Stair Builders. and manuf'rs of Mantels, Odd Pieces of Furniture, &c. 30 West street. up stairs.

Steel Stamps and Stencils.

FLEHARTY, J. H. & CO., Rubber Stamps, Seals, Stencils. 197 Superior street.

Steam Furnaces.

CUYAHOGA STEAM FURNACE CO., Manfrs of Land and Marine Engines. Machinery for Blast Furnaces, Rolling Mills, Bessemer Steel Works, &c. Mill-Gearing and all kinds of Castings, Foundry, Machine and Boiler Shops.

Trunks and Valices.

FABER, J. manuf. Trunk, Traveling Bags and Ladies' Fine Satchels. Sample Trunks and Cases a Specialty. 56 Public Square.

Vessel Agents.

WEBB, H. J. & CO., Ship Brokers and Vessel agents. 17 & 18 Board of Trade Building. 122 Water Street.

Wood Carving.

HERKOMMER, J., Carver and Ornamenter in Composition. 225 Erie street.

Business Directory.

Akron, O.

AKRON IRON CO., manufacture best Common, Refined and Charcoal Iron.

CASCADE HOUSE, cor. Mill and Summit sts., near Depot. J. Downie, Prop.

MCNEIL, J. C., Steam Boilers, Heavy Sheet Iron Work. Repairing promptly executed.

PERKINS, C. E., dealer in Agricultural Implements, machinery, and Manufacturers' Ag'nt

TAPLIN, RICE & CO., manuf'rs. of Stoves and Hollow Ware, dealers in Tinners' Stock, etc.

WEBSTER, CAMP & LANE MACHINE CO., Founders and Machinists, 12 Main street.

AKRON POLISHING & PLATING WORKS. Man'f'rs of solid leather wheels for polishers.

Alliance, O.

MCFARLAND, J. W. Engine and Machine Builder, and General Machine Jobbing.

Buffalo, N. Y.

SANDS, PAUL, Marine and Stationary Steam Engine Works mfr. of drilling mact ines, foot and power lathes. 70 Columbia street.

EMPIRE STATE MF'G CO., O. F. Swift, prop'r. manfr of Fluters, Sad Irons, Spun Copper & Half Copper Tea Kettles. Washington, cor. Ohio

WHITE, L. & I. J. manf'r's of Coopers' Tools, Carpenters' Tools, and Ship Tools Also manf'r's of Planer Knives and Machine Cutters to order 310, 312, 314 Exchange street.

THE BUFFALO NUT AND BOLT CO. [Limited.] Manufrs. of Hot Pressed Nuts, Bolts, Washers, Rivets, &c. No 226 Ohio Street.

Cuyahoga Falls, O.

THOMAS BROTHERS, manfrs of Ohio Stone Ware. Cuyahoga Falls Stone Ware Factory, cor. Main and Broad streets,

TURNER, VAUGHN & TAYLOR, manufacture engines, presses and grinding machinery for clay; also paper, chain, wire and flour mill machinery. Send for Circulars and price list.

SNYDER. H. wholesale manufacturer of Sash, Doors, Blinds, &c. Send for Price Lists.

THE CUYAHOGA FORGE AND IRON CO., manfrs. of every description Car, Truck and Driving Axles, Forging, Shafting. &c.

Business Directory.

Canal Dover, O.

HECKMAN, E., manufr. and dealer in harness leather, upper, kipp and calf. Also, manufacturer & dealer in prime English Dairy cheese. Highest market cash price paid for hides.

Columbus, O.

PAT. ADJUSTABLE WINDOW CURTAIN Cornice, manufactured by Strader's Curtain Cornice Works.

ROYCE & PULLING manufrs of Patent Steam Pumps for all purposes. Store room 30 High street. Works Nos. 5 and 7 Scioto street.

U. S. CARRIAGE CO. builders of fine Carriages, Buggies and Phætons. Salesrooms and Office 257, 259 and 261 Fourth street.

REYNOLDS BROS., manufacturers of hand-cut Files and Rasps. Old files re-cut. Send for Price List.

CITY BOILER WORKS, manfrs of Stationary, Portable and Locomotive Steam Boilers. All work warranted. Borger Bros. & Co.

MURRAY, HAYDEN & CO., manfrs of Malleable Iron. Cor. Randolph & West streets.

Canton, O.

DIEBOLD SAFE & LOCK CO., manuf'rs. Safes. Locks, Bank and Safe Deposit Works.

NOVELTY IRON WORKS, Mill work, Shafting, engines, Imperial job printing press, etc

NEW AMERICAN HOUSE, Canton. Fred. Hipp, Prop.

Erie, Pa.

GUNNISON, A. B., wholesale manufacturer of Wood Pumps. 233 East Twenty-Second St.

BALL ENGINE CO., limited, manufacturers of Automatic Engines of 15 to 30 horse power

NOBLE SEWING MACHINE CO. manfrs of the New Noble Sewing Machine. Send for circulars and prices.

A. B. FELGEMAKER & CO. Church Organ builders. Descriptive catalogue furnished on application.

Geneva, O.

THE ENTERPRISE MACHINE CO., L. L. Crane, Pres't, manfrs of Machinists' Tools and Machinery. Gear Cutting a specialty.

Lima, O.

LIMA HOUSE, centrally located; telegraph office in the house. J. Goldsmith, Prop.

Meadville, Pa.

CURRY & CO. general jobbers in Castings of all kinds.

Olean, N. Y.

MYRICK BROS. & CO., manufact'rs Engines and Boilers, oil drilling tools, rig irons, etc.

Oil City, Pa.

REID, JOS. Machinist, steam engine and pump repairing. Brass and iron castings, light and heavy, made on short notice.

Pittsburgh, Pa.

PRINTING PRESSES. W. A. Bunting, manufacturers' agent. Printers supplies, type, cards. 42½ Sixth Street. [Up stairs.]

BAIR & GAZZAM, practical machinists; gear cutting a specialty. Rice's Feed Water and Heater. 17 Wood street, corner First Avenue.

Painesville, O.

NORTH AMERICAN CUTLERY CO., m'fr's of Steel Shears and Scissors—best quality.

Ravenna, O.

THOMPSON, T. F., dealer in Agricultural Implements, farm machinery, hardware, seeds, fertilizers, &c. Cor. Main and Prospect sts.

BALDWIN, D. L. & SON, Contractors & Builders and manfrs of all kinds of Moulding, flooring, siding, &c. Rip, Band and Scroll Sawing.

Rheims, N. Y.

GREAT WESTERN CHAMPAGNE. Finest made in America. Equal to best imported. Has taken highest awards everywhere, and is used all over the Continent. Try a case, and you will have no other. Pleasant Valley Wine Co., Rheims, N. Y.

Rochester, N. Y.

GOWE, JNO. N., mfrs. of Specialties, such as Machine forging, bridge bolts and trusses, railroad switches, spike, mall, chisels, &c.

ELEVATORS for Hotels, Factories and Private Houses. J. S. GRAHAM & CO.

WOOD-WORKING MACHINERY. Send for Catalogue. J. S. GRAHAM & CO.

RAZOR STROPS. Sole mfrs. of all kinds of Razor Strops. Uischt. Linn & Co. 131 N. Water

Rochester, Pa.

OLIVE STOVE WORKS, (limited) manufacturers of Stoves and Hollow Ware.

Steubenville, O.

DORRANCE, D. W., Tool Works, manufacturer of hand-made miners' and stone-cutters' Tools Promp attention given to mail orders.

Sandusky, O.

SANDUSKY WHEEL CO. manfrs. of Sarven Patent Wheels, Carriage Bodies and Seats, Plain Wood Hub Wheels. Banded Hub Wheels, Jacobs' Patent Neck Yokes.

Business Directory.

Sandy Lake, Pa.

EBERMANN, W. S. & SONS, manfrs. of the celebrated Ebermann Boiler Feeder. Send for Circulars and Price List.

Titusville, Pa.

FOSTER & MCKAY, dealers in boilers and engines, tubing, casing, old iron, rope, and all kinds of metals. Washington street, nr. Railroad.

Toledo, O.

BAKER, HERBERT, Machine Shop and Iron Foundry. 98 and 100 Erie street.

TOLEDO FOUNDRY AND MACHINE CO. builders of Steam Engines, Circular Saw Mills and all kinds machinery. Water St., cor. Cherry

RUSSELL IRON WORKS, mnfrs. of Architectural Iron Work, castings, pulleys, shafting and steam bending machinery. Cor. Water and Lagrange streets.

STANDARD SAW WORKS, H. Bartley, manufacturer and dealer in Saws of every description. All kinds of Springs made from Sheet Steel. Reaper, Hay Knives Truss Springs, &c. made to order. 92 St. Clair Street.

UNION Wooden Ware Manufacturing Co. manufacture Sewing machines, washboards, children's wagons, carts, wheelbarrows, sleds, kitchen wooden ware, &c.

HEPBURN BROTHERS, proprie. Union Boat Works. Boats of all kinds made to order. For sale or rent. Water Street foot of Cherry.

Union City, Ind.

LAMBERT, J. W. & CO., mfrs of fork, rake, hoe and broom handles; spokes, hubs, whiffletrees, yokes, plow-rounds. &c. Correspondence solicited.

Wheeling, W. Va.

EXCELSIOR MACHINE WORKS, Redman & Co., general machinists and manufacturers of Marine and Stationary Engines, Hangers, Pulleies, Shafting, &c. Cor. 18th & Chapline streets.

Youngstown, O.

BELL, EDWIN & SON, manuf. of Nail Kegs, Pat. coiled hoops, slack barrel and keg heading and oil barrel stock.

DINGLEDY, G. H. dealer in rough and dressed Lumber, Shingles and Lath.

MORTON HOUSE, formerly Maitland House, James Morton, Prop.

TOD HOUSE, cor. Diamond and Market streets. Henkel & Bowman, Props.

Zanesville, O.

KIRK HOUSE, William Kirk, proprietor. $1.50 per day.

Brattleboro', Vt,

A JOY FOREVER!
ESTEY ORGANS
Manufactured by
J. ESTEY & CO.,
Brattleboro', Vt.
(Catalogue free on application.)

CLEVELAND
NON-CONDUCTING CO.
MANUFACTURERS & DEALERS IN
ASBESTOS, HAIR FELT,
CEMENT, & OTHER
Pipe Coverings,
19 SOUTH WATER STREET,
CLEVELAND, OHIO.

T. NEW'S
PREPARED
ROOFING
For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free.
T. NEW, 32 John St., New York.
Barrett, Arnold & Kimball,
Western Agents, Chicago, Ill.

E. F. ENSIGN,
JOBBER OF
Agricultural Implements,
WAGONS, FERTILIZERS, SEEDS, &C.
The Empire Grain and Fertilizer Drill and Twine Binding Harvesters Specialties.
134 ST CLAIR STREET, CLEVELAND, O

TRAVELERS' REGISTER.

Lake Shore & Michigan Southern.

TRAINS GOING EAST.	Arrive. From West.	Depart. From East.
Fast N. Y. Express	*1 35 a m	*1 50 a m
N.Y.,Boston & AtlanticEx.	*7 05 a m	*7 30 a m
Elyria Accommodation	†8 35 a m	.....
Pt.Clinton Accommodation	†11 00 a m	.....
Buffalo Accommodation	†11 00 a m	†11 15 a m
N. Y and Boston Fast Ex.	*2 25 p m	*2 55 p m
Conneaut Accommodation	.....	†4 50 p m
Night Express	†10 10 p m	†10 35 p m
TRAINS GOING WEST.	**Arrive. From East**	**Depart. From west.**
Fast Limited Express	*12 23 a m	*12 33 a m
Mich. Ex. via Sandusky	*2 50 a m	*3 05 a m
Chicago Ex. via Sandusky	†6 35 a m	7 00 a m
Mich. Accom. via Norwalk	.....	†6 40 a m
Conneaut Accommodation	†8 40 a m	.....
Toledo Ex. via Norwalk	†1 25 p m	†3 30 p m
St. Louis Ex.via Sandusky	*1 40 p m	*2 05 p m
Chi. Pac. Ex. via Norwalk.	*7 05 p m	*7 35 p m
Pt.Clinton Accommodation	.....	†5 00 p m

Sunday trains for Nottingham—Depart 0:00 a m m. and 2:15 p. m., return at 10:05 a. m. and 4:45 p. m.

☞Reference marks—*Daily. †Daily except Sunday. ‡Daily except Monday.

Cleveland, Columbus, Cincinnati & Indianapolis.

ARRIVALS.

No. 2 Col. & Cin. & Ind'polis Ex.	*7 10	A.M
No. 8 C. T.V. & W. & Clev Accom	10 30	
No. 12 St. Louis & New York Exp.	*3 00	P.M
No 6 Indianapolis & Columbus Exp	10 20	
No 4 Columbus & Cincinnati Exp	*3 40	
No. 10 Wheeling Express	7 15	

DEPARTURES.

No. 1 Cincinnati & Columbus Exp.	*8 00	A.M
No. 11 Cleve, Indianap. & Wheel'g Ex.	7 10	
No. 3 Special St. Louis & Cincinnati Ex**	1 55	P.M
No. 5 Night Express,	*7 25	
No. 7 C. T.V. & W. & Col. Accom	4 00	

**This train runs daily to Indianapolis and St. Louis, and daily, except Sunday, to Cincinnati.

Cleveland, Tuscarawas Valley & Wheeling.

ARRIVALS.

Wheeling & Cleveland Express	8 25	P.M
Uhrichsville Express	10 30	A.M

DEPARTURES.

Wheeling & Cleveland Express	7 15	A.M
Uhrichsville Express	4 00	P.M

New York, Pennsylvania & Ohio.

ARRIVALS	a.m.	a.m.	p.m.	p.m.
Through from East	6 50	.....	.....	*7 00
N.Y. P. & O. (Mahoning)	10 55	.....	2 00	*7 00
Pittsburgh Express	.....	.....	2 00	*7 00
Pittsb'g& Youngs'tn Ac	10 55	.....	.....	10 15
DEPARTURES.	**a.m.**	**a.m.**	**p.m.**	**p.m.**
Through Eastern Train	*7 10	.....	.....	10 45
N. Y. P. & O.(Mahoning)	....	.....	.....	4 25
Youngs'tn & Pitt'sbg Ac.	....	11 00	.....	.....
Pittsburgh Express	.....	*7 10	*2 30	.....

Cleveland & Pittsburgh.

	ARRIVE.	DEPART
Pittsburg & Wheeling	1 45 P.M	8 50 A.M
Express	6 55	2 30 P.M
Alliance Accommodation	10 15 A.M	3 45
Ravenna Accommodation	8 35	5 35
Night Express	6 30 A.M	†11 40 P.M

† Night Express runs daily, except Saturday, by way of Wellsville, and on Saturday by way of Alliance.

Valley Railway.

ARRIVE.		DEPARTUFES.	
No. 2 Accom	10 15 A.M	No. 1 Mail	8 15 A.M
No. 6 Express	1 35 P.M	No. 3 Accom.	2 30 P.M
No. 4 Mail	6 30 P.M	No. 5 Exp.	6 05

Special trains leave on Sunday at 8.25 A. M. and 4.20 P. M., arriving at Cleveland at 10 A. M. and 6.25 P. M.

Trains leave from Depot foot of South Water Street.

Connotton Valley Railway.

Arrive.		Depart.	
No. 1	10 05 A.M	No. 4	9 15 A.M
No. 3	6 40 P.M	No 2	4 05 P.M

All trains arrive and leave depot corner Commercial and Fifth Streets

Cleveland, Akron & Columbus Railroad,

Cleveland, Akron & Columbus Railroad, running over Cleveland & Pittsburgh Railroad to Hudson, for Akron, Columbus, etc

	ARRIVE.	DEPART.
Mail	1 15 P.M	8 00 A M
Express	7 25	1 50 P. M
Accommodation	10 10 A.M	3 45 P. M

CLEVELAND & PITTSBURGH

RAILROAD.

Trains leave Cleveland and arrive at the points named below as follows: Night Express runs daily, all other trains dail except Sundays.

	Mail.	Fast Line.	Accom.	Night Expr'ss.
Leave Cleveland	8 50 am	2 30 pm	3 45 pm	11 40 pm
Arrive Hudson	10 00	3 23	4 50	12 50 am
Ravenna	10 40	3 53	5 50	1 18
Alliance	11 25	4 25	6 05 pm	2 05
N. Philadel	11 35 pm	7 15	.....	10 55
Salem	12 25	.....	.....	3 02
Canton	12 28	5 47	.....	3 20
Massillon via Alliance.	12 50	6 06	.....	3 38
Akron	10 42 am	4 10	5 40 pm	.....
Pittsburgh	3 30 pm	7 45	.....	6 55
Wheeling	5 10	8 00	.....	8 55
Marietta	8 45	.....	.....	.....
Harrisburg.	.....	4 15 am	.....	4 00 pm
Philadelphia	.....	7 56	.....	7 35
New York	.....	11 15	.....	10 35
Baltimore	.....	7 53	.....	7 20
Washington	.....	9 17	.....	8 47
Boston,	.....	8 00 pm	.....	.....

Ravenna Accommodation leaves Cleveland at 5:30 p m, reaching Ravenna at 7:15 p m; Akron 7:23 p m,

Newburgh Accommodations leave Cleveland at 11:00 a m and 12:30 pm. Returning, leave Newburgh at 11:10 am and 1:30 pm.

Passengers for New York, Philadelphia, Baltimore, Washington, and all points east of Pittsburgh make but one change of cars, viz. at Union Depot, Pittsburgh, excepting those leaving on the Fast Line which has Pullman Sleepers from Cleveland to Philadelphia and New York.

The Fast Line leaving at 2:30 P M. has elegant Pullman Palace Sleeping Cars through from Cleveland to New York without change. Pittsburgh Passengers who desire Parlor Car accommodations can secure seats in this car.

The Night Express has Pullman Sleeping Cars from Cleveland to Pittsburgh which can be occupied by passengers at Union Depot, Cleveland, any time after 9:00 P M. At Pittsburgh passengers can take elegant through Parlor or Sleeping Cars for the East.

Sleeping and Parlor Car accommodations from Cleveland and Pittsburgh eastward can be secured at the Union Sleeping and Parlor Car Office Union Passenger Depot; of H. C. Marshall, Union Ticket Office, Weddell House; or of the Ticket Agent at the Euclid Avenue Station.

Through tickets can also be secured at the same points. Baggage checked through from the Union Depot or from Euclid Avenue Station.

By the 8:50 A. M. train a through car leaves daily for Akron, Gambier, Mt. Vernon, Columbus and immediate points, without change.

The 2:30 P. M. train has through car for Akron, Orrville, Columbus and immediate points, arriving in Columbus at 9:25 P. M.

By the 3:45 P. M. Accommodation train cars run through without change from Cleveland to Cuyahoga Falls, Akron and Millersburgh.

Night Express leaving Cleveland at 11:40 P. M., runs daily, and makes connection at Wellsville for Steubenville, Bridgeport, Wheeling, Bellaire and intermediate points. Every night in the week except Saturday the night express runs via Wellsville. On Saturday nights it runs via Alliance. All other trains run daily except Sunday.

Trains arrive at Cleveland.—Night Express at 6:30 P. M., having Pullman Sleeper from Pittsburgh; Ravenna Accommodation, 8:35 A. M., Alliance Accommodation, 10:15 A. M.; New York & Wheeling & Washington Mail, with Pullman Sleeping Car from New York and Philadelphia, 1:45 P. M.; New York, Philadelphia & Wheeling Express, 6:55 P. M.

WM. A. BALDWIN, General Manager. **E. A. FORD,** Gen'l Pass. & Tkt. Agt. Pittsburgh, Pa.

C. L. KIMBALL, District Passenger Agent, corner Bank and St. Clair streets, Cleveland.

Cleveland to New York,

VIA THE

NEW YORK, PENNSYLVANIA AND OHIO RAILROAD.

Formerly Atlantic & Great Western Railroad.]

For New York, Boston and the East. The shortest and quickest route to Pittsburgh, Washington, Baltimore and the Southeast

Until further notice trains will leave the new Central Depot, South Water Street and Viaduct, as follows:

7:10A.M. LIGHTNING EXPRESS, (daily,) sleeping and hotel coaches from Leavittsburg 8:55 a.m. To New York. Albany and Boston without change. Parlor car. Cleveland to Salamanca. Arrives at Meadville 11:20 a.m., (dinner); Franklin, 12:33 p.m.; Oil City, 1:00 p.m.; Corry, 1:00 p.m.; Jamestown, (Lake Chatauqua) 1:57 p.m.; Buffalo, 6:15 p m.; Rochester, 8:30 p.m.; Hornellsville, 6:40 p.m., (supper); Corning, 8:25 p.m.; Elmira, 8:57 p.m.; Binghampton, 10:58 p.m.; Albany, 6:00 a.m.; Boston, 2:45 p.m.; arriving at New York, 6:50 a.m.

10:45 P.M. NIGHT EXPRESS, (daily except Sunday), Sleeping Coach from Leavittsburg to New York without change. Arrives at Youngstown 1:45 a.m; Meadville, 3:50 a.m.; Corry, 5:20 a.m.; Jamestown, 6:22 a.m.; Buffalo, 9:45 a.m.; Rochester, 1:10 p.m.; Hornellsville, 11:20 a.m.; Corning, 12:53 p.m.; Elmira, 1:21 p.m.; Binghampton, 2:50 p.m.; New York, 9:25 p.m.

2:30 P.M. PITTSBURGH EXPRESS,—daily, through without change. Parlor Car, Cleveland to Pittsburgh, arrives at Youngstown, 5:00 p.m.; Pittsburgh, 7:48 p.m; Washington, 7:30 a.m.; Baltimore, 8:19 a.m; via Sharon and Meadville, 7:00 p. m.

4:25 P.M. MAHONING ACCOMMODATION, stopping at all way stations. Arrives at Youngstown, 7:25 p.m; Sharon, 8:30 p.m; Sharpsville 8:40 p.m; connects at Leavittsburg with train No. 20 for Meadville and intermediate points, arrives at Meadville, 11:05 p.m. Pittsburgh, 10:48 p. m.

7:10 A.M. PITTSBURGH EXPRESS,—(daily) through without change. Arrives at Youngstown, 9:50 a.m.; Sharon, 10:55 a.m.; Sharpsville, 11:05 a m.; Pittsburgh, 12:45 p.m. Returning, leave Pittsburgh, 4:48 a.m., 8:33 a.m., and 1:13 p.m. and 4:20 p.m.

11:00 A.M. YOUNGSTOWN & PITTSBURGH Accommodation, stopping at all Way Stations, arriving at Youngstown 1:50 p m; Pittsburgh, 6:10 p.m. Trains arrive at Cleveland, 6:50 a.m., 7:00 p.m., 10:55 a. m. 2:00 p.m., and 10:15 p.m.

☞ This is the only route by which passengers can reach Corry, Elmira, Binghampton, New York City, and intermediate points WITHOUT CHANGE. No change to Boston and New England cities.

Baggage Checked Through to All Points East

☞ Through Tickets and information regarding the route can be obtained at the Union Ticket Office, corner Bank and Superior streets; at office 131 Bank street, and at new Depot of New York, Pennsylvania and Ohio Railway, South Water street and Viaduct, Cleveland.

A. E. CLARK, Gen. Pass'r. Agt., Cleveland, Ohio.

J. M. FERRIS, Gen. Man'gr. Cleveland

M. L. FOUTS, Pass. Agt., 131 Bank st., Cleveland.

NOTICE.—Hereafter all Passes must be returned to the General Passenger Agent within FIVE DAYS after date of expiration; otherwise they will be discontinued,

Blue Grass Route of Ohio

TIME TABLE.

The Cleveland, Mt. Vernon and Delaware RAILROAD.

GEO. D. WALKER, RECEIVER.

SOUTH-BOUND TRAINS

STATIONS.	Accom	Accom	Expr	Mail	Sundays only
Leave.	P. M.	P. M.	P. M	A.M.	P M.
Cleveland	5.30	3.45	2.30	8.50	.....
Hudson	6 53	5.02	3 35	10.10	4 20
Cuyahoga Falls	7 11	5.30	3.53	10.29	4 40
Akron	7.23	5.46	4.10	10.42	5 00
*North Portage	P M.	6.00	4 24	10.54*	6 14
Clinton	.....	6 19	4.44	11.09	5 31
Warwick	.....	6 29	4.49	11.14	5 37
*Marshallville	.....	6 43	5.02	11.27*	5 50
Orrville	.....	6 58	5.14	11.42	6 02
*Apple Creek	.....	7.17	5 32	11.58*	6 22
Fredricksburg	.....	7.32	5.45	12.11	6 37
*Holmesville	.....	7.43	5 55	12.21*	6 48
Millersburg	Accom	7.55	6.08	12.34	7 00
	A. M.	P M.			A.M.
Millersburg	5.50	.....	6.08	12.34	7 00
*Killbuck	6.02	.....	6.20	12.47*	7 12
*Black Creek	6.18	.....	6.31	12.59*	7 25
Gann	6.33 B 6.53 S	.....	6.51 7.11 S	1.19	7 47
Danville	7.04	.....	7.20	1.29	7 59
Howard	7.18	.....	7.29	1.38	8 10
Gambier	7.22	.....	7.38	1.47	8 20
Mt. Vernon	7.35	.....	7.51	2.00	8 33
*Bangs	7.45	.....	8.01	2.10*	8 45
*Mt. Liberty	7.53	.....	8.09	2.20*	8 54
Centerburg	8.05	.....	8.18	2.30	9 05
*Condit	8.19	.....	8.32	2.44*	9 19
*Sunbury	8.27	.....	8.40	2.53*	9 28
*Galena	8.32	.....	8.45	2.58*	9 34
Westerville	8.48	.....	9.00	3 15	9 50
Arrive at Columbus	9.15	.....	9.25	3.40	10 20
	A.M		P M	P.M.	A.M

NORTH-BOUND TRAINS.

STATIONS.	Expr	Mail	Accom	Accom	Sundays only
Arrive at	P M	P.M.	A. M.	A. M.	A.M.
Cleveland	1 45	6 55	10.15	8.30	.....
Hudson	12.35	5.48	8.53	7.15	10.30
Cuyahoga Falls	12.16	5 30	8.33	6 58	10.11
Akron	12.03	5.17	8.20	6.45	9.50
*North Portage	11.46	5.00*	8.03	A. M.	9.34
Clinton	11.30	4 44	7.46	.....	9.18
Warwick	11 25	4 37	7.37	.....	9.12
*Marshallville	11.10	4.27*	7.23	.....	9.00
Orrville	10.57	4.14	7.10 B 6.40 D	.....	8.47
*Apple Creek	10.40	3.56*	6.22	.....	8.27
Fredricksburg	10.26	3.43	6.08	.....	8 13
*Holmesville	10 16	3.33*	5.58	Accom	8.02
Millersburg	10 05	3.22	5.45	7.50	
			A. M.	P. M	P.M.
Millersburg	10 05	3.22	.....	8 35	7.25
*Killbuck	9 51	3.08*	.....	8.23	7.13
*Black Creek	9 39	2.57*	.....	8.11	7.00
Gann	9.17	2.36	.....	7.49	6 38
Danville	9.07	2.27	.....	7.39	6.25
Howard	8.58	2.18	.....	7 29	6.14
Gambier	8.49	2 09	.....	7.14	6 03
Mt. Vernon	8.37	1.57	.....	7.02	5.51
*Bangs	8.22	1.40*	.....	6.46*	5.37
*Mt. Liberty	8.14	1.31*	.....	6.37	5.28
Centerburg	8.05	1.22	.....	6.28	5.17
*Condit	7.51	1.09*	.....	6.14	5.03
*Sunbury	7.42	1.01*	.....	6 06	4.53
*Galena	7.37	12 56*	.....	6.00	4 47
Westerville	7.20	12 40	.....	5.43	4 30
Leave Columbus	6.55	12.15	.....	5.15	4.00
	A. M.	P M		P. M.	P.M.

* Stop on signal. B Breakfast. S Supper.

Special Round trip rates will be made for Sunday trains.

The Blue Grass Route of Ohio (Mt. Vernon line) will abandon their regular Sunday trains after September 10th, 1882.

N. MONSARRAT, Gen'l Supt. Akron, O

E. T. AFFLECK, General Passenger Ag't, Columbus, O.

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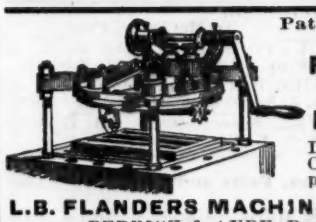
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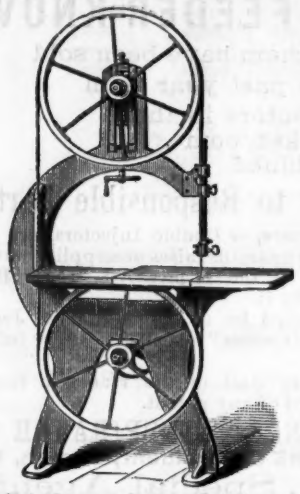

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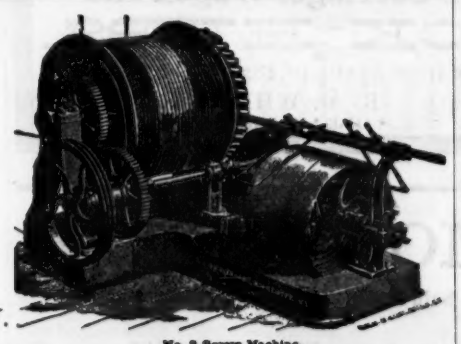

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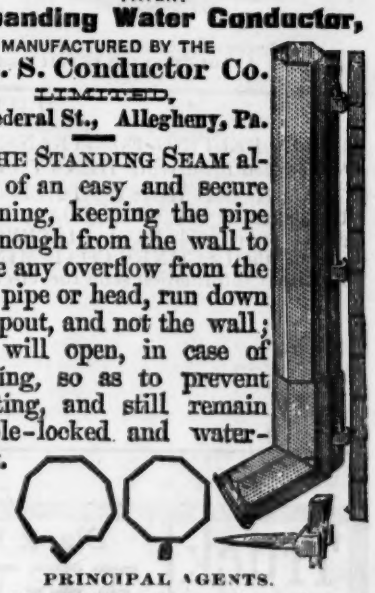

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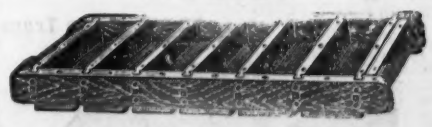

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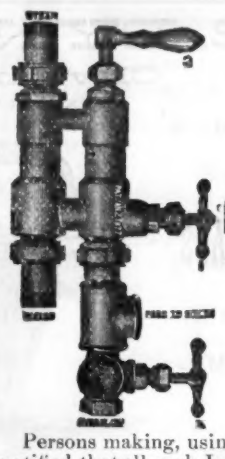

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IS THE

INJECTOR PERFECTED,

IT IS THE

BEST BOILER FEEDER KNOWN,

And more of them have been sold during the past year than all Injectors in the market combined.

Thirty Days Trial to Responsible Parties.

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On the 23d of June a suit in chancery was commenced by it against James Jenks, of Detroit, Mich., for making and selling the "Duplex Injector," so-called. Other infringers will be promptly sued.

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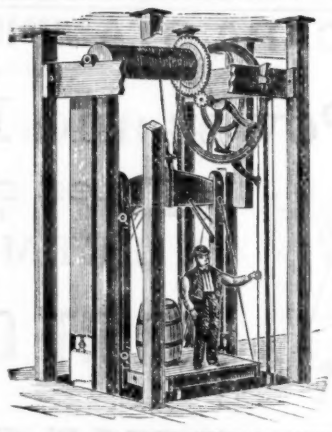
H. M. WHITNEY, President, Boston, Mass.

Fairbanks, Morse & Co., Special Agents.
CLEVELAND, OHIO.



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OTTO SILENT GAS ENGINE,
From 1 to 25 horse power.

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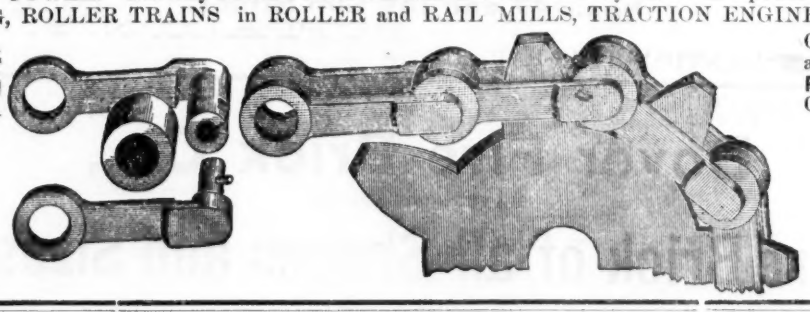

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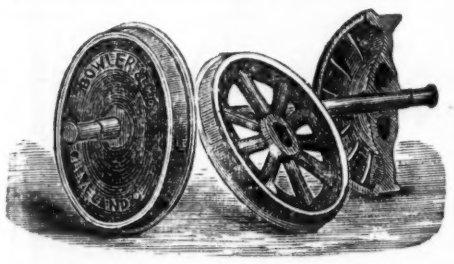

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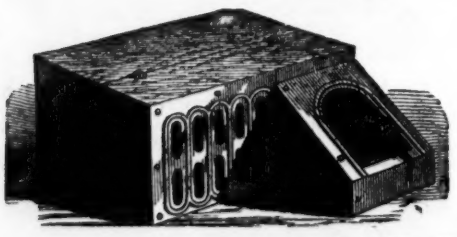
52,932 Mouse Traps Sold in October, 1881.



THIS IS THE ONLY

SELF-SETTING TRAP

ON THE MARKET.

"The mouse goes in to get the bait
And shuts the door by his own weight,
And then he jumps right through a hole
And thinks he's out; but bless his soul
He's in a cage, some how or other,
And sets the trap to catch another."

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8th.—That we guarantee our prices as low for same quality as any house in the country

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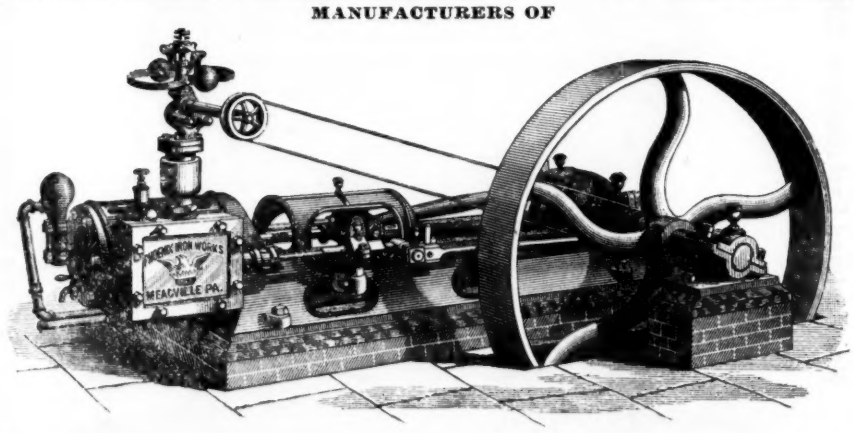

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Celebrated Cabinet Turret, Screw Chasing, and Hand Lathes,

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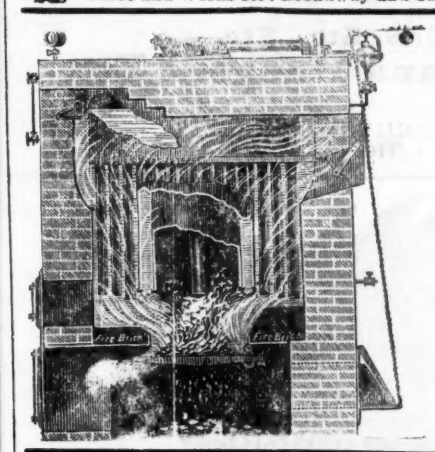

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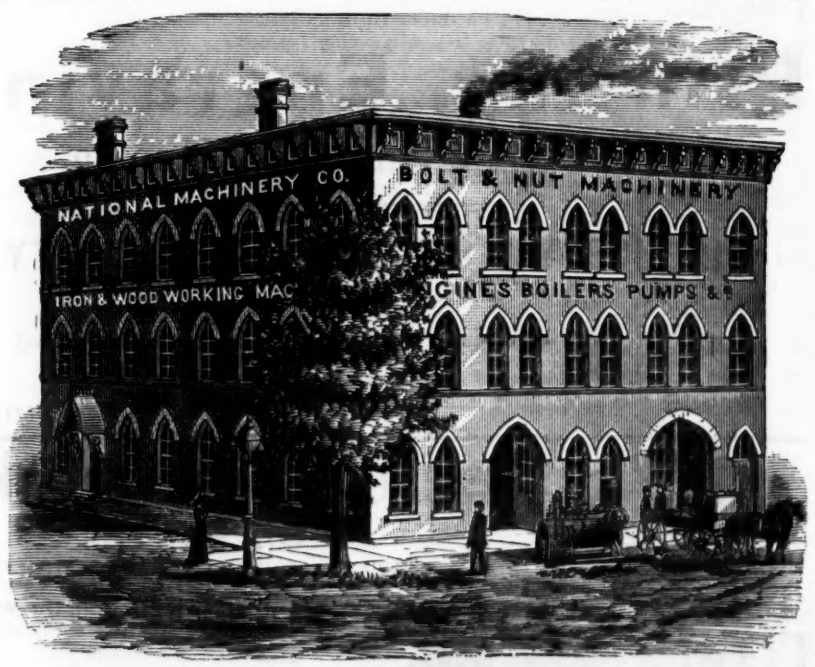

GREAT SALE OF IRON AND WOODWORKING MACHINERY.

The National Machinery Co., of Cleveland, O., having decided to move their manufactory to Tiffin, O., will remove from their present premises, corner of Bond and Rockwell streets, and in consequence desire to dispose of

The Largest Stock of New and Second-hand Machinery

for wood and iron in the markets. We enumerate some of the principal Tools:

List of Wood Tools:

One second-hand Frank two-spindle Shaper, $65
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One " " " " Spoke and Handle Lathe, $125
One " " 22-inch Greenwood Heading Planer, $125
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One " " 24-inch Ball & Co , Planer and Matcher.
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One " " Fay & Co. Railway Cut-off Saw.
Two " " Sandpaper Drums.
One second-hand Dimension Planer, 24 inches with feed attachment.
One " " wood frame swing Cut-off Saw and Table.
One " " Slotting Machine.
One " " Tnorn & Dehaven Drill.
Two " " Saw Tables.
One wood frame 6-inch Sticker.
Large lot second-hand Trenton Vises.
Large lot second-hand Anvils.
One Fay & Co. Agricultural Morticer, with boring attachment.
One Fay & Co. iron frame Tenoning Machine, double heads

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16-inch Crank Planer, new.
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Full assortment of Bolt Cutters.
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Our 8x14, 9x12 10x12, 10x14, and 12x16 all new.

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Two Skinner & Wood 6 to 8 H. P in prime order.
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Having removed our Salesroom to the large room previously occupied by the Wilson Sewing Machine Company, we are able to carry a very fine line of Wood Working Machinery and other Tools.

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of every description, adapted for either slow or rapid hoisting, and with or without Friction Clutches or Steam boilers, &c. I am now prepared to manufacture my recently designed

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To parties wishing to build newly designed machinery I give especial attention.

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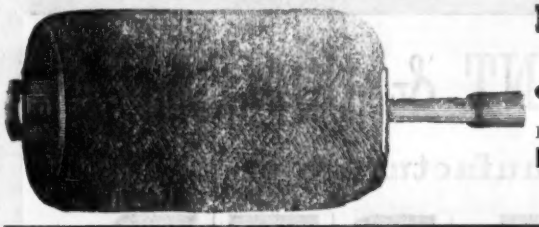

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